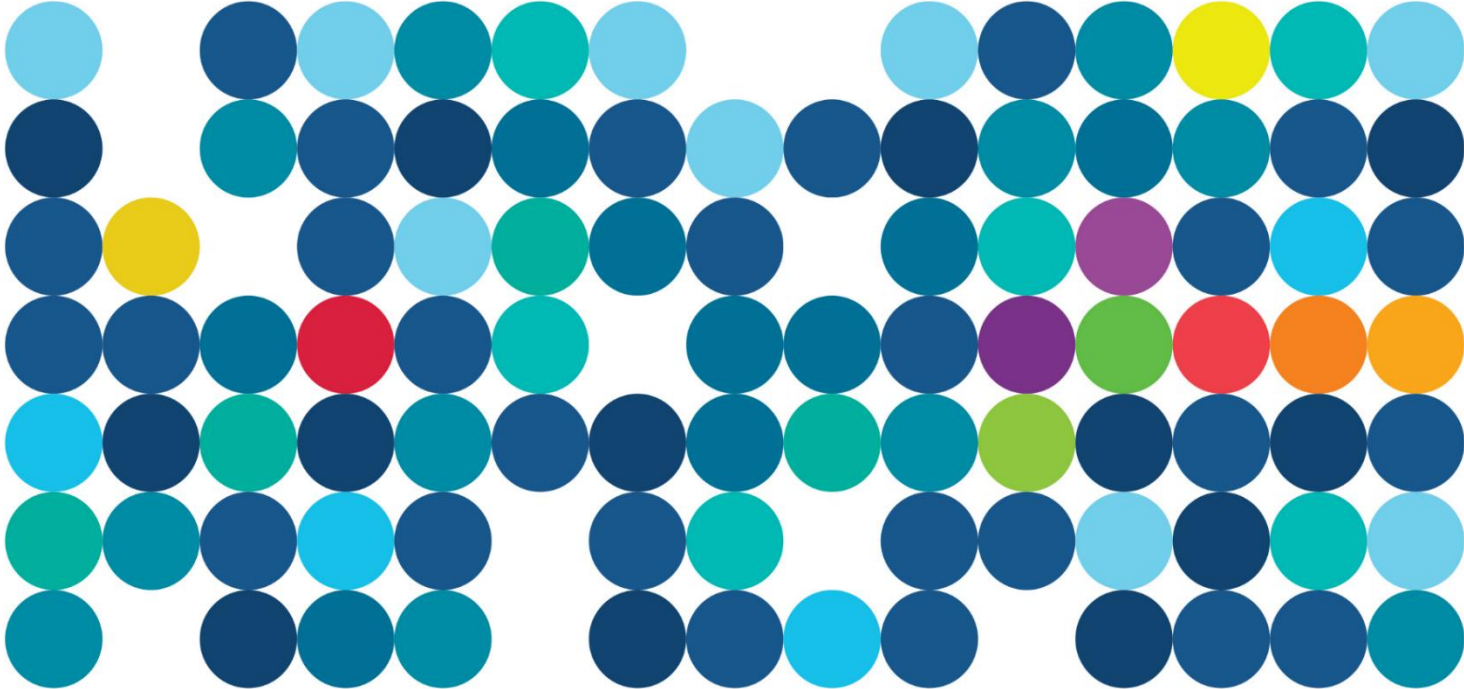


Technical Guidelines

For safely working near Water Corporation assets





Revisions

This guideline has been revised on the dates shown.

Revision number	Issue date	Reason for change
1.0	June 2017	Initial Issue
2.0	June 2019	Annual update



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1. Definitions

In this guideline the following words and expressions have the following meanings. These meanings do not necessarily align with the meanings given in other Water Corporation publications or in legislation.

Alignment	The line on which the pipes are laid and measured from the adjacent cadastral boundary.
Approval	Approval of a third party to conduct work in, on over, under or within the Prescribed Proximities to Water Corporation assets.
Assets	Includes any of our water, wastewater and drainage assets, but in this guideline most commonly refers to water pipelines, sewer pipelines and drainage pipelines and their associated fittings and structures.
Damage	Physical damage to and interference with our assets. Damage includes coating or lining damage, dents, scratches, cracks, bending, displacement, perforation, ruptures, joint opening. Interference includes: preventing or restricting access for operation and maintenance. Damage can also include potential impacts that our assets can have on your works.
Design engineer	An engineer who is suitably qualified with appropriate engineering experience who is responsible for preparing design drawings and documents.
Design standard	Water Corporation's design standard relevant to the works being undertaken.
Prescribed Proximities	The proximity, or proximities, to an asset, prescribed by Water Corporation under Section 90 of the <i>Water Services Act 2012</i> within which approval is required before a person can undertake certain work.
Risk	The likelihood of work causing damage to our assets, as well as our assets causing damage to your work.
Services	Includes telecommunications cables, gas mains, power poles and cables, as well as water, wastewater and drainage assets owned by other organisations.
Third-party	The individual, group of people or organisation that is undertaking work near Water Corporation assets.
Works	The development of all types of buildings, structures and other obstructions (including residential buildings, pools, sheds, carports, major developments, transport infrastructure, services, stockpiles, ground anchors, trees, equipment installed on our assets), and any work that causes changes to the ground (including movement of heavy vehicles, blasting, pile driving, ground compaction, dewatering, earthworks, open and trenchless excavations).
Zone of influence	The zone of influence is an area extending both horizontally and longitudinally along a buried pipeline. It is the area in which loads from buildings or structures on the surface may potentially cause damage to the pipeline. Settlement or disturbance of the ground within this zone may also cause damage to buildings or structures on the surface above.



2. Introduction to working near our assets

We have developed this guideline to assist anyone who is planning or conducting work near our assets. This includes the development of buildings or structures and any work that causes changes to the ground, including:

- development of buildings, transport infrastructure and other structures
- earthworks and alteration of surfaces
- movement of heavy vehicles (other than on permanent roads)
- work causing excessive vibrations (such as blasting, pile driving, ground compaction)
- dewatering
- open and trenchless excavations
- installing ground anchors
- installing buried and overhead services
- planting and removing trees
- installing equipment on our assets (such as telecommunications antennas on water tanks).

These activities, and other similar activities, can cause damage to our assets which can be expensive, and highly disruptive to the community and hazardous to your employees and the general public. Damage can include physical damage such as rupturing an asset, as well as preventing or restricting access for operation and maintenance.

Our assets may also present a risk to your work and the safety of your employees. Occasionally our assets fail for reasons that are unrelated to third party works (such as from aging, corrosion or mechanical failures) which can have hazardous impacts.

This guideline provides information and advice about working safely near our assets to reduce the risk of potential damage or injury. It describes:

- when you are required to obtain approval from us
 - *If you are undertaking work in, on, over, under or within the Prescribed Proximities to our assets, you have a statutory requirement under Section 90 of the Water Services Act 2012 to seek approval from us prior to starting work*
- options for reducing your risk of potential damage or injury
- requirements for protecting our assets.

Please note that in those situations where these guidelines appear to be in conflict with the Utility Code of Practice, the Code of Practice takes precedence.

2.1 Safety - Your Responsibility

At all times the safety of the general public and your employees for your works remains your responsibility.

- You therefore have to determine how to best conduct the work in consideration of the information provided in this guideline, while ensuring that you maintain a safe system of work at all times.
- You have a duty of care to ensure that your works do no damage or interfere with our assets or **cause hazards to any party.**



Potential Hazards

Potential hazards associated with Water Corporation assets include, but are not limited to:

- Large forces associated with the release of water or wastewater under high pressure
- Rapid release of large volumes of water which may lead to drowning or traffic hazards
- Biohazards associated with contact with wastewater
- Exposure to asbestos (asbestos cement pipe and asbestos in some pipe wrapping)
- Exposure to toxic gasses in the wastewater system
- Exposure to hazardous wastes discharged by various industries to the wastewater system
- Ignition of combustible gasses in the wastewater system
- Fall hazards associated with accessing access chambers or high structures
- Electric shock hazards arising from Electrical infrastructure in the vicinity of pipelines, electrical faults or lightning
- Secondary hazards arising from damage or disruption to other structures or services due to damaged pipelines

Occasionally our assets also fail for reasons that are unrelated to third party works (such as from aging, corrosion or mechanical failures) which can also have hazardous impacts.

Authorised Access Only

Unauthorised interference with Water Corporation sewers and other assets (including uncovering, opening or repairing) is prohibited and may result in prosecution under the *Water Services Act 2012* (WA).

Responsibility

Parties are also responsible for all **OSH and public safety requirements** associated with their works. All works must be carried out in accordance with the relevant acts, regulations standards and codes of practice, as well as arranging any approvals, clearances etc required by other agencies.

Liability

Under Section 90 of the Water Service Act: *A person must not drill, bore, excavate or use impact equipment within the prescribed proximity to water service works, of a prescribed kind, of a licensee, or engage in any other activity within the prescribed proximity that may damage those works, except in accordance with the approval of the licensee.*

Penalty: a fine of \$10 000

Disclaimer

Any plans or other information provided by Water Corporation must be used as a guide only. Plans (including the location of pipes and other assets) are approximate only and it is your responsibility to locate the exact location of Water Corporation assets before commencing work. Water Corporation does not warrant or make any representation as to the accuracy, completeness, reliability, currency, quality or fitness for purpose of any plans or other information (including, but not limited to, the accuracy of the scale of, or the location of, anything shown on any plan or diagram).

2.2 Who to contact for support

If after referring to this document you are still unsure as to whether or not the work you are doing requires our approval, or you are unsure about any of the information provided, please email us at POS_enquiries@watercorporation.com.au



Any damages must be reported immediately by calling our 24-hour Faults and Emergencies line on 13 13 75

3. Understanding our assets

We operate an extensive network of water, wastewater and drainage assets throughout Western Australia.

There are many different types of assets in use but those that are at greatest risk of damage are our buried pipelines. With increasing population densities, more pipelines are being installed underground. This is creating increased competition for space and an increased risk that your work may cause damage to our assets, or that our assets may cause damage to your work.

Our pipelines have different functions, criticalities, sizes, depths and materials. Many pipes operate at high pressures and flow rates, and some may contain hazardous gases. Pressurised pipelines present greater risks than pipelines that flow by gravity.

The main types of pipelines include:

Water supply pipelines

Trunk main	A water supply pipeline that connects a main water source, such as a reservoir, to water storage, such as a water tank. Trunk mains are typically larger pipelines that have a diameter of 300 mm and greater and do not normally service individual properties.
Distribution main	A water supply pipeline that connects water storage to water reticulation. Distribution mains are typically larger pipelines that have a diameter of 300mm and greater and do not normally service individual properties.
Water reticulation	A water supply pipeline that services individual properties. They are typically smaller pipelines that have a diameter of 250 mm and smaller.

All water supply pipelines operate under pressure.

Wastewater pipelines

Sewer main	A wastewater collection pipeline that flows by gravity. Sewer mains typically have a diameter of 375 mm or greater and do not normally service individual properties.
Sewer reticulation	A wastewater collection pipeline that services individual properties and flows by gravity. This typically includes pipelines that have a diameter of 300 mm and smaller.
Sewer pressure main	A wastewater collection pipeline that operates under pressure. This includes sewer pipelines that operate under vacuum. Sewer pressure mains do not service individual properties.

Drainage pipelines

Main drain	A stormwater pipeline that flows by gravity and is controlled by the Water Corporation. They tend to be larger in size (greater than 450 mm) and commonly provide an outlet for local authority drainage schemes.
Drainage pressure main	A drainage pipeline that operates under pressure.
Open drain	An open channel used for discharging stormwater.



3.1 Pipeline locations

Many of our pipelines are located in road reserves and public open space but pipelines can also be found in private property. Sewers are the most common type of pipeline located in private property however occasionally sewer pressure mains, water pipelines and main drains can also be found.

3.2 Pipeline condition

Our pipelines vary in age and condition; they can be brand new and in as-new condition to over 50 years old and in poor condition.

3.3 Pipeline material

Our older pipelines are typically constructed from the following materials:

- AC asbestos cement
- CI cast iron
- VC vitreous clay
- S steel
- RC reinforced concrete.

Common materials for newer pipelines include:

- PVC polyvinyl chloride
- PE polyethylene
- GRP glass reinforced plastic
- DI ductile iron
- S steel
- RC reinforced concrete.

Newer pipeline materials are considered to be more robust than older pipe materials which are typically more brittle or more likely to be in worse condition, therefore more easily damaged.

3.4 Pipeline fittings and structures

There are many different fittings and structures associated with our pipelines. These fittings and structures are essential for pipeline operation and delivery of services to the community.

Common fittings and structures include:

- thrust and anchor blocks
- cathodic protection test points
- flushing, injection and sampling points
- maintenance structures (such as access chambers, manholes, maintenance shafts)
- valves
- water hydrants
- flow measurement devices (such as water meters).



Some of these fittings will be identifiable by indicators on the surface, such as covers and lids, while other fittings will be below ground and will not be visible.

Buried fittings may be located at different depths than the pipeline, or may be offset from the centre of the pipeline and therefore do not always accurately indicate the pipeline location. For example, air valves extend from the top of a pipeline, while scour valves extend from the bottom and are usually offset to the side. Similarly, maintenance structures can also be offset from the centreline of the pipe.

Examples of some of the fittings and structures that are visible on the surface are shown below.



Figure 1 Cathodic protection test point (left); valve cover; trafficable sewer maintenance cover

3.5 Water tanks and towers

Water tanks and towers are also sometimes affected by third party works. Since they are located at elevation they are commonly used for mounting telecommunications equipment to avoid building other structures.

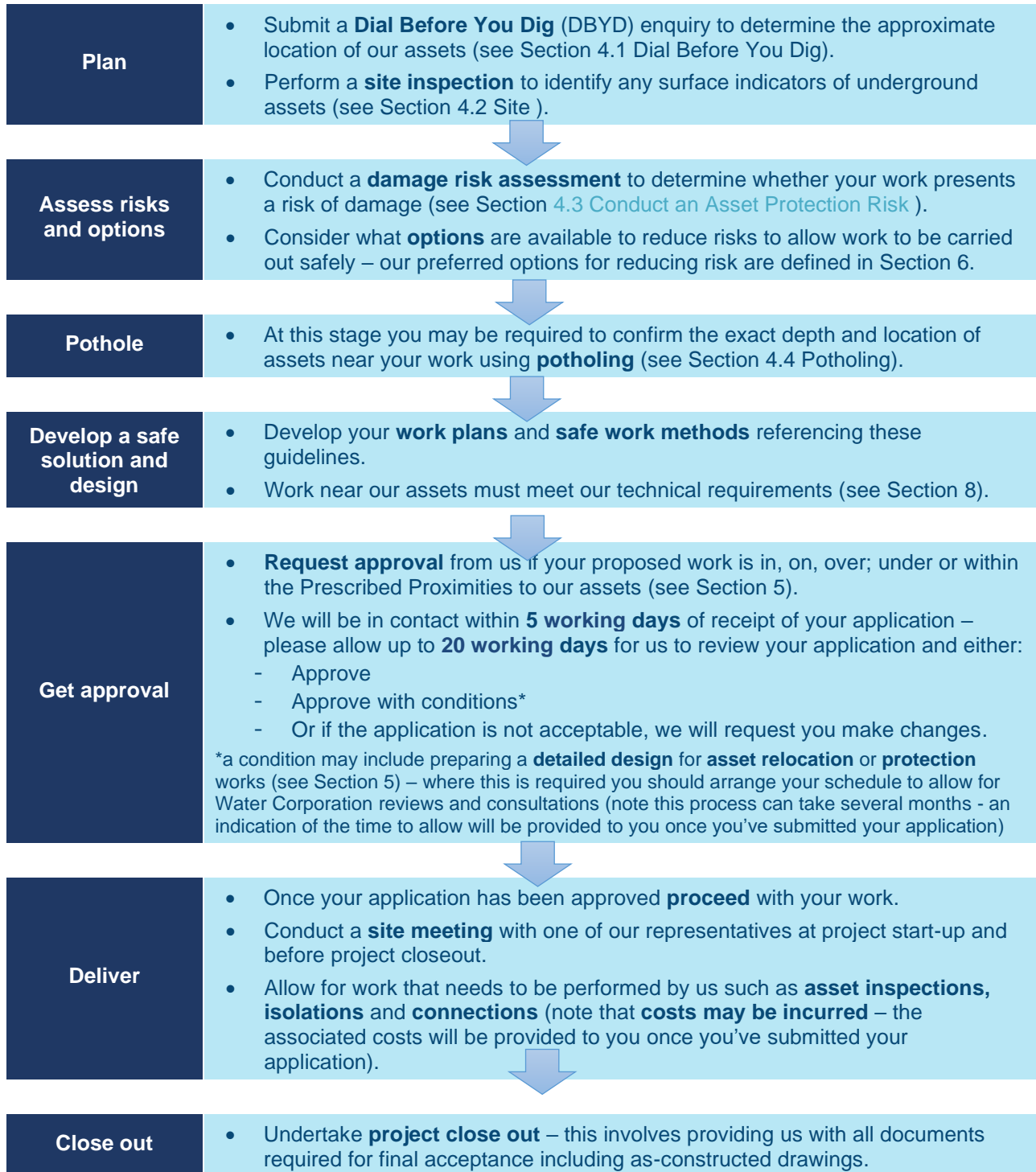
3.6 Other assets

Other Water Corporation assets include pumping stations, emergency storage facilities, reservoirs and treatment plants. These assets are usually in dedicated reserves or landholdings, but this isn't always the case.



4. Process for working near our assets

Damage can be avoided by carefully planning and conducting your work. The steps below outline the process for working safely near our assets:



Also refer to the Working near Water Corporation assets planning checklist provided in to help with planning your work.



4.1 Dial Before You Dig

Before you start work you should always submit a Dial Before You Dig (DBYD) enquiry to determine the approximate location of our assets.

DBYD allows you to request plans from multiple asset owners who have assets in the work area. You can request plans on-line at www.1100.com.au or by calling 1100.

The plans are intended to allow you to identify what assets are near your work so you can determine what steps need to be taken to reduce the risk of potential damage. **The plans should never be relied on as the sole means of locating assets.** Actual asset details and locations should be accurately confirmed using potholing (refer to Section 4.4 Potholing).

The annotations on the DBYD plans will help you to identify asset type, size and material. Guidance on how to interpret the DBYD plans will be returned within the response to your DBYD request. A [Plan Legend](#) available from our website can also be used to interpret the plans.

The following information should also be considered when you are reviewing the plans:

- Individual sewer and water services to properties are not usually shown on the plans however their existence should be assumed – some properties such as hospitals may have more than one sewer or water service to the property.
- Only Water Corporation owned assets are shown on the plans – there may be other water, wastewater or drainage services not shown on the plans such as drains that belong to local government or Main Roads Western Australia. Information about these services may need to be requested from these agencies if they are not returned with your DBYD enquiry.

If you require plans in AutoCAD design format for your work, you can use our online network database system [ESInet](#) to extract network data plans.

4.2 Site inspection

A physical inspection of the site where the works are proposed will allow you to assess the working environment and identify any surface indicators of underground assets. Refer to Section 3.4 for information about the different types of pipeline fittings and structures which may point to the location of buried pipelines.

4.3 Conduct an Asset Protection Risk Assessment

If you have identified Water Corporation assets near your proposed works conduct an asset protection risk assessment to determine whether your work presents a risk of potential damage. Your risk assessment should consider the following questions.



Table 1 Questions to consider when completing a damage risk assessment

Will the site work.....	Yes	No	Not sure
Cause direct contact in any way with a pipeline (including any relatively minor contact with the protective coating)?			
Involve digging adjacent to or otherwise disturbing pipeline foundations, bedding or other support?			
Cause subsidence of a pipeline, supporting material or structures?			
Cause high loads to be applied directly to a pipeline or the soil above it?			
Result in high impacts, shock or vibration near or directly to a pipeline?			
Limit access to a pipeline or other assets for future works or maintenance?			
Cause electrical currents to be directly applied to or induced in a pipeline?			
Interfere with cathodic protection?			
Has Safety been considered in the design of your works?			
Impact on the Water Corporation’s ability to maintain its assets?			

If your work presents a risk, consider what options are available to reduce these risks to allow the work to be carried out safely. Our preferred options for reducing the risk of potential damage are defined in Section 6.

4.4 Potholing

The location, depth and direction of all assets near your work must be confirmed using potholing. This is also a requirement under Section 3.21 of the *Occupational Safety and Health Regulations 1996*.

Potholing is the technique of locating buried assets by careful hand digging trial holes or by the use of other non-destructive techniques such as vacuum excavation, air excavation or water excavation. The use of mechanical excavation equipment to pothole is not allowed without a [Clearance to work permit](#). Hand digging and vacuum extraction methodology for potholing does not require a permit.

Our requirements for potholing include:

- potholing must be undertaken with reference to DBYD plans and other information we provide - the amount of potholing required will depend on the size of your work area, density of assets in your work area, and the risk of potential damage associated with your work
- the location of all potholed assets is to be surveyed by a qualified surveyor – all survey coordinates are to be in the MGA94 coordinate system
- potholes must be backfilled once the work has been completed – clean bedding material should be used for the first 300 mm above the exposed asset.

You can engage independent location services to undertake potholing work for you. You can find location services in the Yellow Pages, listed under ‘Underground service locators’.

Electronic detection technology may be used in combination with potholing to positively verify assets. Metallic and reinforced concrete assets which contain steel, may be detected with electronic detection technology, however non-metallic assets cannot be detected by this method. Pipe material may also change over a distance, sometimes changing from metallic to non-metallic material and back again.

For additional information on potholing refer to Section 6.3 of the Utility Providers Code of Practice which is available from the [Main Roads Western Australia website](#).



5. Requesting approval

5.1 When you need to request approval

Whether you are a property owner, contractor or developer, you may require approval before working near our assets.

Under Section 90 of the *Water Services Act 2012*, we require you to request approval if your proposed works are in, on, over, under or within the Prescribed Proximities to our assets. The Prescribed Proximities are summarised in Table 2 below.

For full details of the Prescribed Proximities and relevant legislation refer to our [Legal Document](#) available on our website.

In accordance with the Act:

A person must not:

- *Erect, construct, install, place or demolish any building, plant, wall, fence or other obstruction in, on, over or under, or within the prescribed proximity to water service works of a licensee, except in accordance with the approval of the licensee.*
- *Drill, bore, excavate or use impact equipment within the prescribed proximity to water service works, of a prescribed kind, of a licensee, or engage in any other activity within the prescribed proximity that may damage those works, except in accordance with the approval of the licensee.*

Penalty for an individual: a fine of up to \$10,000

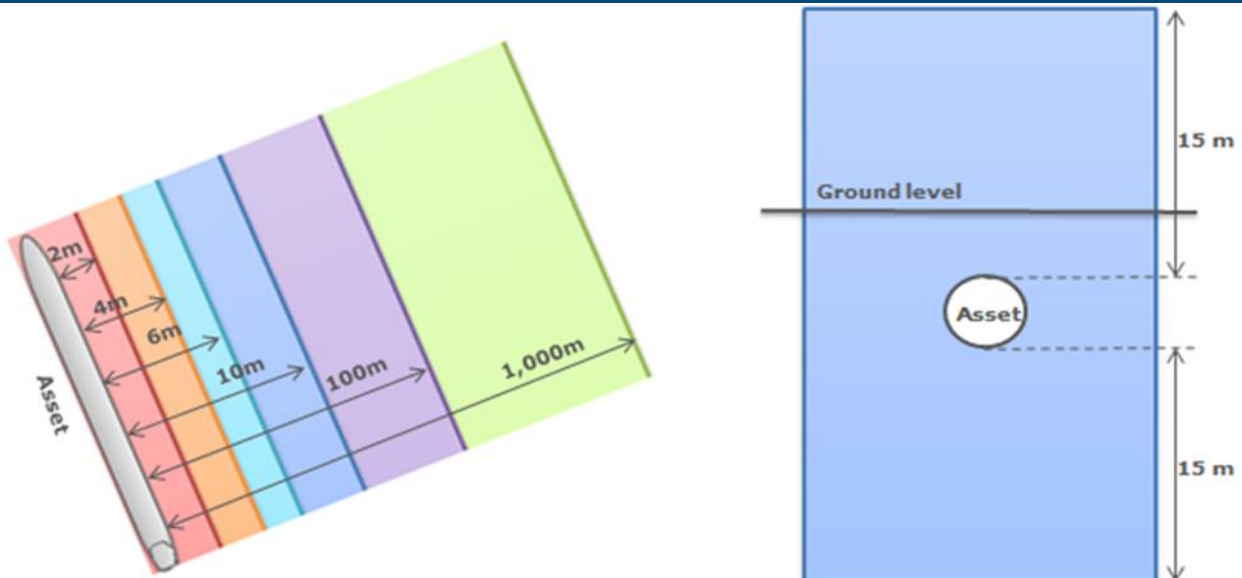
The Prescribed Proximities have been established to protect our assets and your work from damage, as well as to ensure that you avoid costs and inconvenience associated with ceasing, demolishing, removing or altering your work as necessary to protect our assets.



Table 2 Summary of the Prescribed Proximities – works within these proximities requires our approval

Type of works	Asset type	Asset size	Prescribed Proximity (distance from the asset)
Ground disturbing works Including movement of heavy vehicles, ground compaction, dewatering, earthworks, open and trenchless excavations	Sewer pipelines	All	2 m
	Main drains	All	
Ground disturbing works	Water supply pipelines	< 300 mm diameter	4 m
Ground disturbing works	Water supply pipelines	≥ 300 mm diameter	6 m
	Sewer pressure mains	All	
	Drainage pressure mains	All	
Buildings, structures and other obstructions Including residential/commercial/industrial buildings, pools, sheds, carports, major developments, transport infrastructure, services, equipment installed on our assets, stockpiles, ground anchors, large trees	All assets	All	10 m both sides of the asset 15 m above & below the asset
Pile driving	All pipelines	All	100 m
Blasting	All pipelines	All	1,000 m

Prescribed Proximities – plan view (left) and elevation view (right)



Work that does not require approval

- Lightweight structures, fences and walls that can be readily removed
- Planting and removing trees that have a mature height of less than 5 m

Note that requirements still apply to these types of works – refer to Section 8



In most instances work conducted outside of the Prescribed Proximities will have no impact on our assets, however in all situations you must still assess the risk of potential damage associated with your work. If you have any doubts about the potential for your work to cause damage email us at POS_enquiries@watercorporation.com.au.

5.2 How to request approval

There are two different application processes for requesting approval depending on the type of work you are conducting.

Lodge your application online through [BuilderNet©](#) if your work relates to:

- residential buildings
- commercial and industrial buildings
- sheds
- garages and carports
- swimming pools and spas
- retaining walls.

For other types of work you can lodge your application via our [online application form](#) on our website. This includes work relating to:

- development of key infrastructure (main roads, railway, bridges, tunnels, major building developments)
- earthworks and alteration of surfaces
- movement of heavy vehicles (other than on permanent roads)
- work causing excessive vibrations (such as blasting, pile driving, ground compaction)
- dewatering
- open and trenchless excavations
- installing ground anchors
- installing buried and overhead services
- planting and removing trees
- installation of noise walls
- installing equipment on our assets (such as telecommunications antennas on water tanks).



6. Reducing risk

If you are considering working near our assets, we recommend you consider the following options to reduce the risk of potential damage (in order of preference):

Redesign your work	The preferred option is for you to redesign your work to be outside the Prescribed Proximities to our asset
Relocate our asset	Where you are not able to redesign, our assets may be able to be relocated, raised or reconfigured
Protect our asset	Where redesign and relocating are not feasible, we may allow you to work within our Prescribed Proximities if you adequately protect our asset

These options are explained in more detail in the following sections.

6.1 Redesign your work

In all instances, the preferred option is for you to redesign your work to be outside the Prescribed Proximities to our assets.

6.2 Relocate our asset

Where you are not able to redesign your work, relocation of the affected asset away from your work may be considered.

Our requirements for relocation works are as follows:

Proposed relocations of **water reticulation** and **sewer reticulation** assets shall be designed by a design engineer who is a suitably qualified practicing professional engineer with appropriate engineering experience and is a holder of our current design standards.

For all **other assets**, relocation designs must be completed by one of the design engineers from our prequalified engineering consultants list.

All proposed relocations shall be in accordance with current editions of applicable Water Corporation and Australian Standards. Some of our most common design standards relating to sewer, water and drainage assets are listed below. [Full List of Design Standards](#)

Table 3 Water Corporation design standards

Asset type/process	Design standard or manual
Water reticulation	Design Standard 63
Sewer reticulation and mains	Design Standard 50 and the Water Services Association of Australia Sewage Code
Sewer pressure mains	Design Standard 51
Water distribution mains and trunk mains	Design Standard 60
Main drainage	Design Standard 66
Drawing standards	Design Standard 80
Pipe fittings drawings	Design Standard 65
Protective coatings	Design Standard 95
As relevant	Strategic Product Register



We also have additional standards for work that may include SCADA, mechanical, electrical, cathodic protection and other specialised work.

To enquire about our design standards or request access to our standards please email idb.standardsenquiries@watercorporation.com.au.

We will not be responsible for any costs associated with asset relocation that is necessary to offset the effects of your work. This includes the cost of any necessary isolations, connections and inspections that may need to be performed by our personnel.

Asset relocations will normally be like-for-like replacements (material, size and pressure rating) except for AC, CI, RC and VC pipelines which should be replaced with an approved pipe material as per our design standards) of equal internal diameter.

We will assess proposed relocations with consideration to future demand requirements in which case we may request pipelines to be increased in size or strength. We will bear the cost of replacements above and beyond like-for-like replacements required to meet future demands.

6.3 Protect our asset

Where redesigning your work and relocating our assets is not practicable, we may allow you to work within the Prescribed Proximities.

We will only consider this option if you:

- 1) demonstrate that redesigning your work and relocating our asset are not feasible options
- 2) demonstrate that you have a safe system of work in regard to any hazards associated with working on or near our asset.
- 3) adhere to our technical requirements for protecting our assets (see Section 8)
- 4) where necessary, employ methods that protect our asset and your work from potential damage
 - *Temporary protection* - this type of protection is typically used for temporary works that will only remain in position for a short time, and can include:
 - *Adapting your work methods* - such as supporting an excavation with shoring to prevent loss of ground support around an asset
 - *Selecting alternative construction equipment* - such as using ground compaction equipment that generates smaller vibrations
 - *Permanent protection* - this type of protection is typically used for permanent works that will remain in position for a long time such as buildings and structures.

We will not be responsible for any costs associated with protection works that is necessary to offset the effects of your work.

6.3.1 Permanent protection

Proposed protection works for **water reticulation** and **sewer reticulation** assets shall be designed by a design engineer who is a suitably qualified practicing professional engineer with appropriate engineering experience and is a holder of our current design standards.



For all **other assets**, protection works must be designed by one of the design engineers from our [prequalified engineering consultants list](#).

. All permanent protection works shall be designed with a 100-year design life, and shall be in accordance with current editions of applicable Water Corporation and Australian Standards (refer Table 3).

Drawings for all permanent protection works are to be certified by the design engineer and submitted to us for approval. It is the designer's responsibility to ensure that the selected protection method is suitable for the particular application, including confirming that the ground conditions are acceptable for the final design.

Examples of some permanent protection methods are provided below in Table 4.



Table 4 Examples of permanent protection methods:

Protection Method	Description
<p>Sleeves</p>	<ul style="list-style-type: none"> • Sleeves can be used to enable pipelines to be removed and replaced with minimal impact to the surrounding environment and infrastructure; they also provide protection for nearby infrastructure against potential pipeline leaks and bursts. • Sleeving is a common requirement where: <ul style="list-style-type: none"> ▪ a road (or other type of transport infrastructure) cannot be easily closed, or traffic cannot be readily diverted, to allow for maintenance and repair ▪ public safety would be compromised by the need for road closure due to a combination of high speeds and large traffic volumes ▪ the pipeline is a critical asset and would require urgent repairs. • The use of sleeving is generally not recommended for larger pipes – larger pipes are more difficult to remove from sleeves therefore preventing access for maintenance and repair. • Sleeves can be made from various materials depending on their application including RC and GRP. • Sleeve class and pressure ratings shall be suitable for the particular application – RC Class 4 pipe is generally required for railways, freeways and highways. • Sleeves for cathodically protected steel assets shall be non-metallic and electrically isolated from the steel asset. • The area at entry and exits of the sleeves needs to be secured to allow future access (such as with buried pits or bollards). • Pipelines should be held in place in sleeves using spacers or spiders – the void space between pipeline and sleeve should generally not be grouted except for at the openings (to allow for easy removal of the asset). • Where sleeves are below the maximum level of the water table, or in areas subject to flooding, sleeves shall be fully watertight.
<p>Banding and Jointing</p>	<ul style="list-style-type: none"> ▪ When joints on existing steel main are to be affected by new works, a number of measures may be employed to improve or maintain the integrity of the joints <ul style="list-style-type: none"> ▪ External Bands may be required on those existing steel mains where modifications will result in the pipe being difficult to access, and joints are not already double welded and internally corrosion protected. ▪ Joints can also be rewrapped either as part of a banding program or as a measure in this own right. This measure is often required due to the breakdown of the original petroleum based wrapping systems over time. ▪ It is general practice that in new works and relocations, pipework will be so configured to avoid any joints falling under a roadway or site of limited access. ▪ When modern Sintakote or Sintalock pipes are in service, their propriety brand joints are of such a standard as it will generally be unnecessary to carry out further joint protection – though any conventionally welded joints may need attention as above



Piles

- Piles are a type of foundation that are installed into the ground to provide support to a structure and are commonly used to transfer loads from buildings to be built within the zone of influence of an asset (refer to Section 7 for further information on the zone of influence).
- Piles must be founded to a depth below the asset's zone of influence or to refusal in stable rock, such as limestone.
- Sufficient minimum horizontal clearance from the asset should be allowed for to prevent influence of the pile installation on the asset from vibration or soil movement – the clearance distance shall be the building restriction zone (see Section 7.2 Building restriction) plus any additional distance required to prevent damage to the asset.
- Where piling is required the following information must be provided:
 - a pile detail which shows the depth and width of pile (see Figure 2 below)
 - a site plan showing the position and spacing of the piles.
- The pile detail and site plan must include both the date and the signature of the structural design engineer, which must be clearly visible.
- Piles are to be installed by an experience piling contractor who is accredited (by an approved Australian authority if required) for the type of piles being installed.
- Piles must extend a minimum of 300mm below invert level or the zone of influence

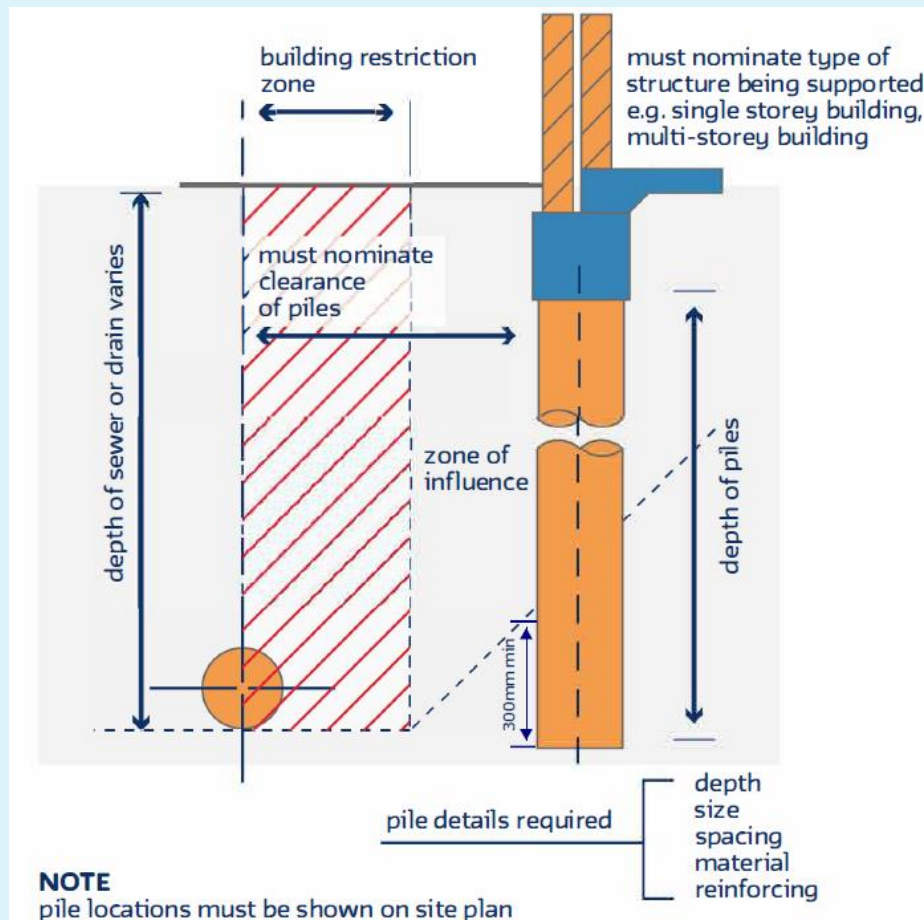
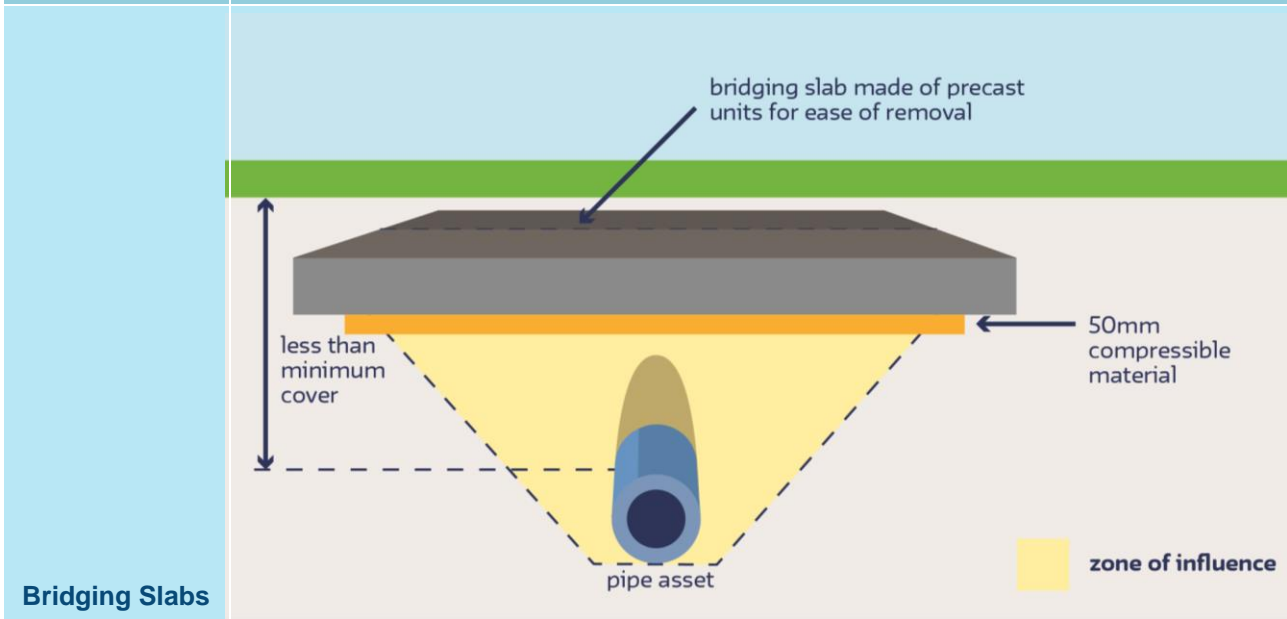


Figure 2 Example pile detail – actual design to be certified by a suitably qualified structural design engineer



Tunnels	<ul style="list-style-type: none"> ▪ The use of tunnels to protect assets against additional loading from residential, commercial and industrial buildings must only be used as a last resort. ▪ Similar to sleeves, tunnels provide protection and access to pipelines that cannot be excavated for maintenance and repair. ▪ Tunnels also allow full access to the pipelines without it needing to be removed from the tunnel. ▪ A common application of a tunnel is under key transport infrastructure where sleeves are not deemed to be appropriate, such as a large water main under a freeway. ▪ Tunnels are not acceptable in high groundwater locations. ▪ Appendix 3 provides design guidance for enclosing sewers and drains in tunnels.
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Bridging Slabs	<p>Figure 3 Bridging slab</p> <ul style="list-style-type: none"> • This method of protection permanently impedes access to the pipeline for maintenance and repair and should therefore only be used as a last resort requiring permission of the Water Corporation. • Bridging slabs are only to be used where minimum cover requirements cannot be achieved (see Section 8.7). • They are not to be used to protect assets against additional loading from residential, commercial and industrial buildings and structures. • The slab must span over the asset for a distance determined by the zone of influence of the asset as shown in Table 2 above (refer to Section 7 for more information on the zone of influence). • A layer of compressible material is to be placed underneath the span of the slab. • The slab size, weight and design must allow for easy removal for access to the asset for maintenance and repairs – slabs can be made up of precast units for ease of removal if required.
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Concrete Encasing

- This method of protection permanently impedes access to the pipeline for maintenance and repair and should therefore only be used as a last resort requiring permission of the Water Corporation.
- Concrete encasing provides additional permanent protection to pipelines from external loads and movement, reducing the risk of potential damage and consequently the need for repairs.
- The only application concrete encasing is generally permitted is when minimum ground cover requirements cannot be achieved (see Section 8.7) – concrete encasing is also generally only suitable for sewers and drains.
- Encasement may be used for steel, DI, PVC, PE, GRP and VC pipelines, but is not appropriate for:
 - mechanical joint couplings, flanged joints and lead joints
 - pipelines with external corrosion or damage
 - AC and CI pipelines
 - pipelines in unstable or subsidence areas.
- Concrete encasement can take the form of a plain concrete surround or can be reinforced to provide additional strength and control cracking of the concrete.



7. Zones around our assets

In assessing your application and the risk of potential damage, consideration will be given to the following zones:

- 1) Zone of influence.
- 2) Building restriction zone.
- 3) Zone of construction.

These zones are mostly specific to buried pipelines and should be taken into consideration when developing your work plans and work methods.

7.1 Zone of influence

The zone of influence is an area extending both horizontally and longitudinally along a buried pipeline. It is the area in which loads from buildings or structures on the surface may potentially cause damage to the pipeline. Settlement or disturbance of the ground within this zone may also cause damage to buildings or structures on the surface above.

In general your work must not:

- cause subsidence of soil within the zone of influence
- be reliant on soil within the zone of influence for structural support
- restrict removal of soil within the zone of influence.

Factors which determine the zone of influence are:

- 1) The building restriction zone – refer to the definition in Section 7.2 Building restriction below for details.
- 2) The nature of ground – the boundary of the zone of influence is determined by the angle of repose of the surrounding ground – the angle of repose is the steepest angle at which loose ground material is stable.

We have developed a set of graphs which illustrate the zone of influence for **sewer reticulation, sewer mains and main drains** (i.e. pipelines that operate under gravity) that can be used in the context of **residential, commercial and industrial buildings and structures** (refer Appendix 2: Zones around our assets – for buildings and structures).

For all **other types of work** and **other types of pipelines**, the zone of influence can be determined using the illustration below as a guide.

If your work presents a high risk, we may request you to engage a suitably qualified geotechnical design engineer to determine the zone of influence for a particular site.

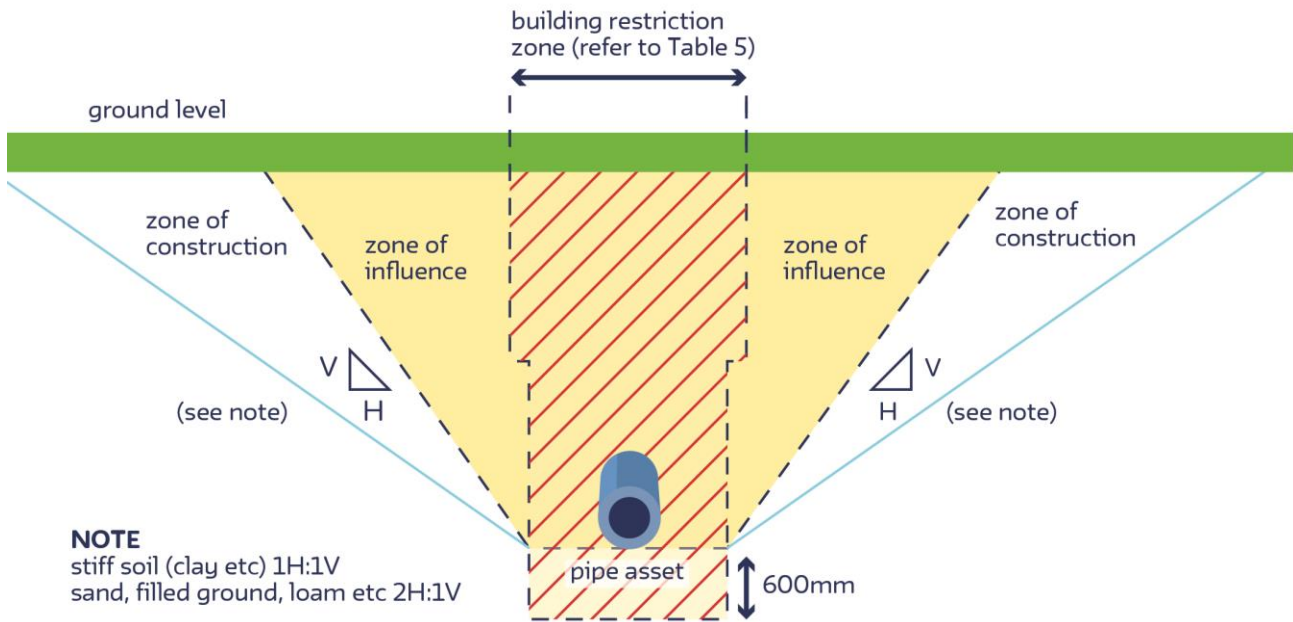


Figure 2 Zone of influence

7.2 Building restriction zone

A building restriction zone applies to the area directly above, below and adjacent to a buried pipeline. Work is generally not permitted within this zone.

The depth of the building exclusion zone is taken from ground level to 600 mm below the pipeline invert level.

The width of the building restriction zone is the minimum width required to excavate the pipeline (using trench supports) to safely undertake emergency maintenance and repairs, which depends on the size and depth of the pipeline.

The building restriction zones indicated on the graphs contained in Appendix 2 should be used for **sewer reticulation, sewer mains and main drains** (i.e. pipelines that operate under gravity) in the context of **residential, commercial and industrial buildings and structures**.

For all other types of work and buried pipelines, the following building restriction zones apply:

Table 5 Building restriction zones* (to be read with Figure 4 above) Only applicable to Non-Pressurised Assets

Pipeline depth	Pipeline size		
	< 300 mm	300–600mm	> 600mm
< 3.0 m	1.2 m	2.0 m	2.2 m + pipeline diameter
3.0 – 5.0 m	2.0 m	2.0 m	3.0 m + pipeline diameter
> 5.0 m	3.0 m	3.0 m	4.0 m + pipeline diameter

*Zone width is defined as total width with pipe centrally located



7.3 Zone of construction

The zone of construction is the area where the ground may have been previously disturbed to install our pipelines. In general, there are no requirements for building in this zone however soil conditions should be assessed prior to construction.



8. Technical requirements for protecting our assets

This section details technical requirements for common types of work which may be relevant if you are considering the need to work within the Prescribed Proximities to our assets.

Depending on the specific aspects of your work, **we may identify requirements that differ from those described in the following sections.**

Please read and understand all sections that apply to your work; there may be more than one section that is relevant. If you need further advice on how to apply these requirements, or if you need additional information not covered in the following sections please email us at POS_enquiries@watercorporation.com.au

8.1 Single storey and multi-storey structures

Single storey and multi-storey structures are permanent structures that include:

- habitable buildings
- commercial buildings
- industrial buildings
- carports and garages attached to main buildings
- outbuildings*
- above ground industrial tanks
- fixed plant (permanent machinery and equipment)
- fixed above ground pools
- fences and walls greater than 1.8 m in height.

*Outbuildings are non-habitable buildings that are detached from main buildings, such as sheds, carports, patios, or gazebos. They are generally classified as being built from masonry walls, or are non-masonry with floor areas that exceed 42 m². If you are building a non-masonry outbuilding that has a floor area smaller than 42 m² refer Section 8.3 Lightweight .

Typically, structures with a height of 4 m or less are classified as single storey structures, and structures with a height of greater than 4 m are classified as multi-storey structures.



Requirements

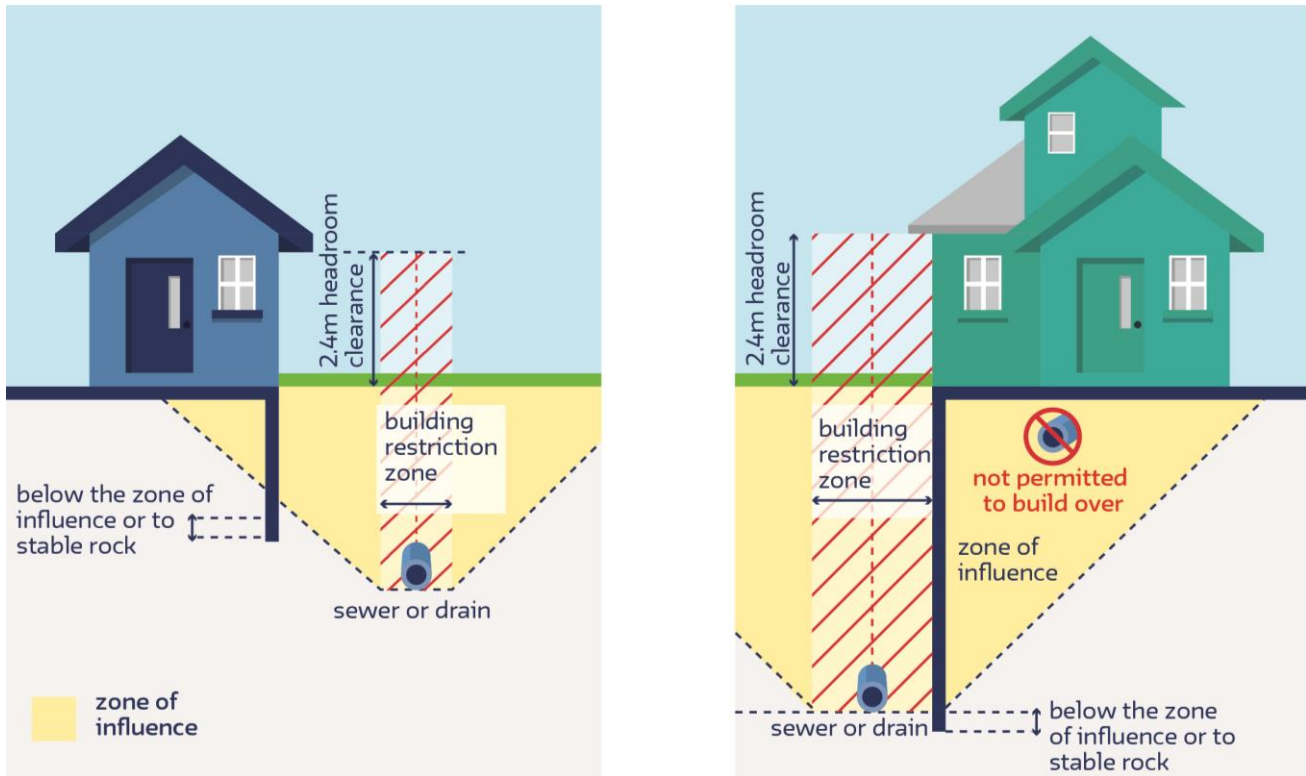


Figure 3 Single storey buildings (left) and multi-storey buildings (right)

Single storey and multi-storey structures are generally not allowed within the Prescribed Proximities to any of our pressurised pipelines (this includes water supply pipelines, sewer pressure mains and drainage pressure mains). Where you consider there to be no alternative options, please seek specialist advice from us at POS_enquiries@watercorporation.com.au.

Single storey and multi-storey structures within the Prescribed Proximities to our sewer reticulation, sewer mains and main drains may be considered subject to the following requirements:

- The structure must be self-supporting within the zone of influence – this is commonly achieved using foundation supports such as piles which extend to a depth below the zone of influence or to stable rock (refer to Section 6.3 for guidance on pile design).
- The structure must be outside the building restriction zone – if all other options have been exhausted we may allow the use of tunnels to protect against additional loading from single storey and multi-storey structures inside the building restriction zone however this option is only permitted as a last resort (refer to Section 6.3 for guidance on tunnel design).
- An unconfined access way of at least 1.0 m wide must be maintained around the edge of sewer and drain maintenance structures at all times (see Figure 4).
- Where a sewer or drain passes between two structures a 2.1 m access passage must be maintained between the two structures at all times.
- A headroom (clearance between finished ground level and the underside of an overhanging structure such as a roof) of at least 2.4 m must be maintained at all times (see Figure 4).

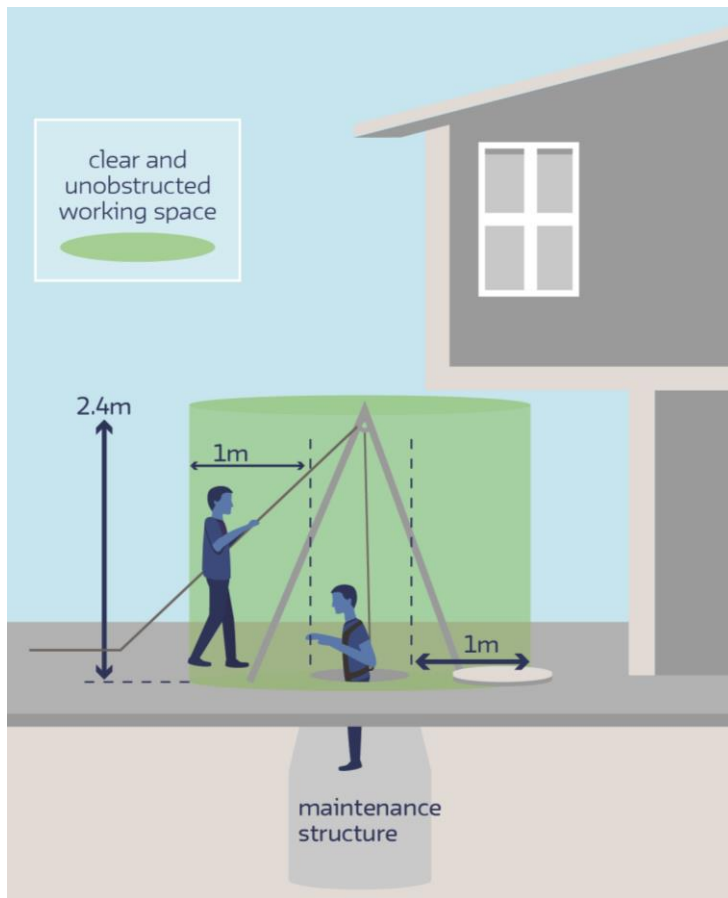


Figure 4 Access clearances around sewer and drain maintenance structures



8.1.1 Ground floor slabs

Applications to cantilever ground floor slabs over sewers and drains may be considered subject to the following requirements:

- The asset has a diameter of 300 mm or smaller.
- The ground floor slab extends no further than the pipeline centreline.
- The ground floor slab is supported by a continuous wall which is supported on a strip footing that extends below the zone of influence or to stable rock (see Figure 5).

Ground floor slabs which do not meet these requirements will be considered in special situations and will require detailed designs by a qualified structural engineer.

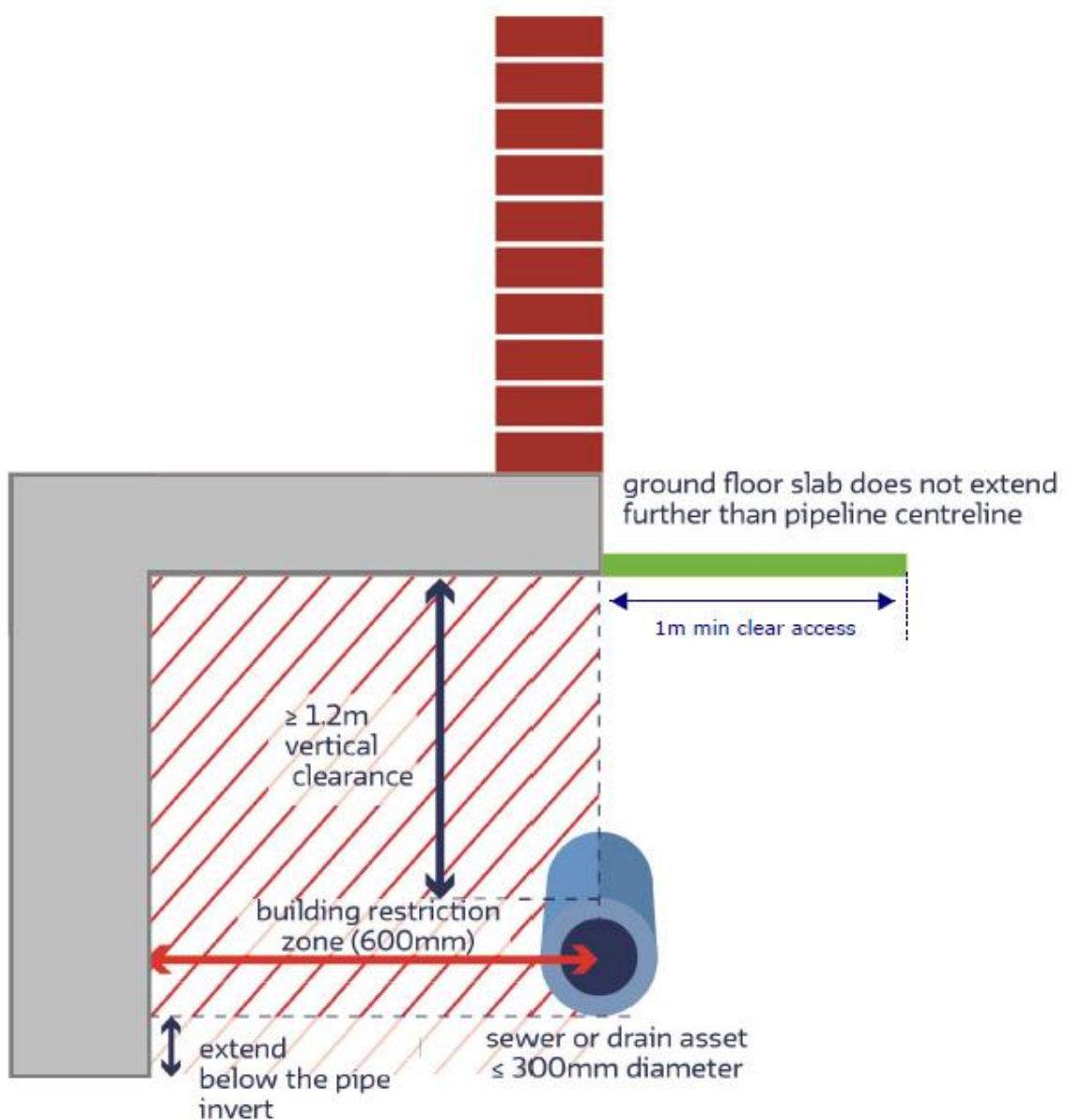


Figure 5 Ground floor slab



8.1.2 Above-ground floor slabs

Applications to project above ground floor slabs over sewers and drains (such as to form balconies) may be considered subject to the following requirements:

- a) The asset has a diameter of 300 mm or smaller.
- b) At least 2.4 m minimum headroom (clearance between the ground level and the underside of the slab) is maintained at all times above the asset.
- c) Columns are allowed to be suspended from above ground slabs provided they are for aesthetic purposes only and do not provide structural support to the slab or surrounding structure – certification from the design engineer is to be provided demonstrating that the columns are purely decorative
- d) The slab is for a single residential dwelling.

Above ground floor slabs which do not meet these requirements will be considered in special situations and will require detailed designs by a qualified structural engineer



8.2 Underground structures

Underground structures are permanent structures that include:

- below ground swimming pools and spas
- below ground tanks
- basements.

Requirements

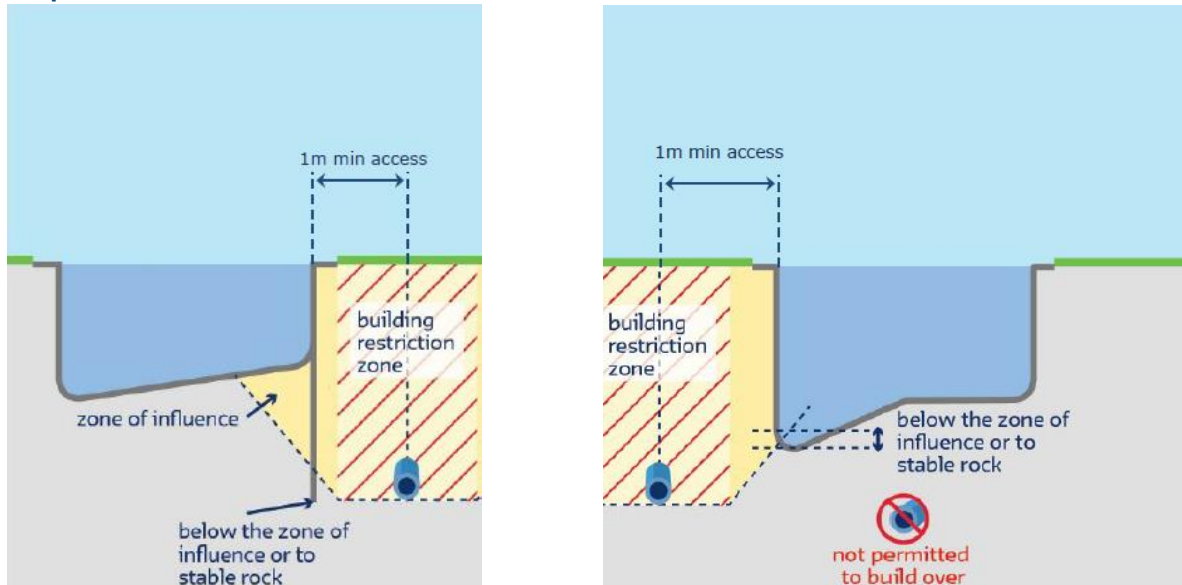


Figure 6 Underground structures

Underground structures are generally not allowed within the Prescribed Proximities to any of our pressurised pipelines (this includes water supply pipelines, sewer pressure mains and drainage pressure mains). Where you consider there to be no alternative options, please seek special advice from us.

Underground structures within the Prescribed Proximities to sewer reticulation, sewer mains and main drains may be considered subject to the following requirements:

- The structure must be self-supporting within the zone of influence – this is commonly achieved using foundation supports such as piles which extend to a depth below the zone of influence or to stable rock (refer to Section 6.3 for guidance on pile design).
- The structure must be outside the building restriction zone.
- An unconfined access way of at least 1.0 m wide must be maintained to and around the edge of sewer and drain maintenance structures at all times (see Figure 4).
- Allowance must be made for excavation of the asset for maintenance and repair without undermining the integrity of the adjacent below-ground structure.

Some pools are designed to be supported by the surrounding soil when they are full. Where continued use of a pool is important, such as public swimming pools and hotel developments, you may want to consider designing the pool to allow adjacent assets to be excavated without needing to empty pool.



8.2.1 Laying sewers in basements

In certain cases involving major construction activities, applications to lay sewers and drains in basements (e.g. underground car park) may be considered subject to the following requirements:

- a) The asset has a diameter of 300 mm or smaller when suspended.
- b) Maintenance access points must be provided at all bends.
- c) Access must be available 24 hours a day.
- d) A headroom (distance between the basement floor and ceiling) of at least 2.4 m must be maintained at all times and a clear 1m access way alongside.
- e) Sewers and drains slung from the underside of a basement ceiling are provided with suitable structural supports. The sewer should be supported at each joint and at intervals that ensure maintenance of the required grade without deflection where the pipe is full (e.g. during blockages). The spacing of pipe supports should not exceed that recommended by the pipe manufacturer.
- f) Where sewers or drains pass through basement walls, provision must be made to protect against settlement and the shearing effect of buildings or structures without causing damage to the sewer. A compressible foamed plastic insert or similar is normally acceptable as a means of filling the space between the pipe and the building or structure. Typically clearances of 50 mm to 80 mm would be allowed, however, the actual dimensions are to be determined based on the structural design engineer's assessment of long-term building or structure settlement.



8.3 Lightweight structures

Lightweight structures are structures that are detached from main buildings and be readily dismantled and removed at any time. Some examples include:

- colourbond sheds
- framed patios
- framed carports
- decking
- above ground demountable pools, spas and tanks
- road signs.
- portable road safety barriers

Requirements

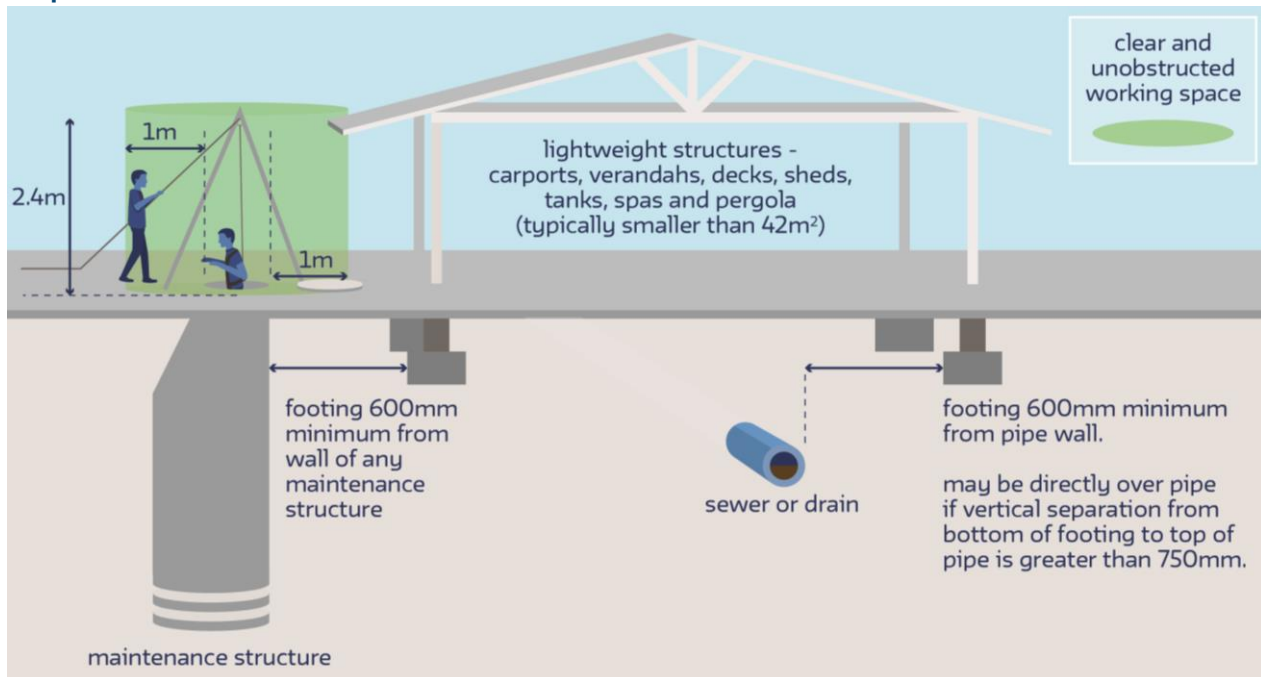


Figure 7 Lightweight structures

Lightweight structures are exempted from requiring our approval however the following requirements still need to be considered before working near our assets:

- Pressurised pipelines* (water supply pipelines, sewer and drainage pressure mains) – lightweight structures are not to be placed within the zone of influence of our pressurised pipelines.
- Sewers and main drains* – lightweight structures can be placed over sewers and drains provided there is a:
 - vertical clearance between the top of pipe and footing of at least 750 mm
 - horizontal clearance between the pipe wall and footing of at least 600 mm.
- Lightweight structures are not to be built directly over sewer and drain maintenance structures and:



- an unconfined access way of at least 1.0 m wide must be maintained around maintenance structures at all times.
 - A horizontal clearance of at least 600 mm must be maintained between maintenance structures and any footings.
- d) A headroom (distance between the ground level above the asset and underside of the structure) of at least 2.4 m must be maintained at all times.

8.4 Fences and walls

This section covers the requirements for lightweight walls and fences that can be readily dismantled and removed at any time. This typically includes:

- timber, metal or concrete fibre fences no greater than 1.8 m high*
- mass walls made from brick, stone or concrete no greater than 1.8 m high*
- noise attenuation walls no greater than 1.8 m high*
- retaining walls no greater than 1.2 m high**.

* Fences and walls greater than 1.8 m high are typically treated in the same manner as single storey structures (refer Section 8.1)

** For requirements of retaining walls greater than 1.2 m and refer Section 8.5

Requirements

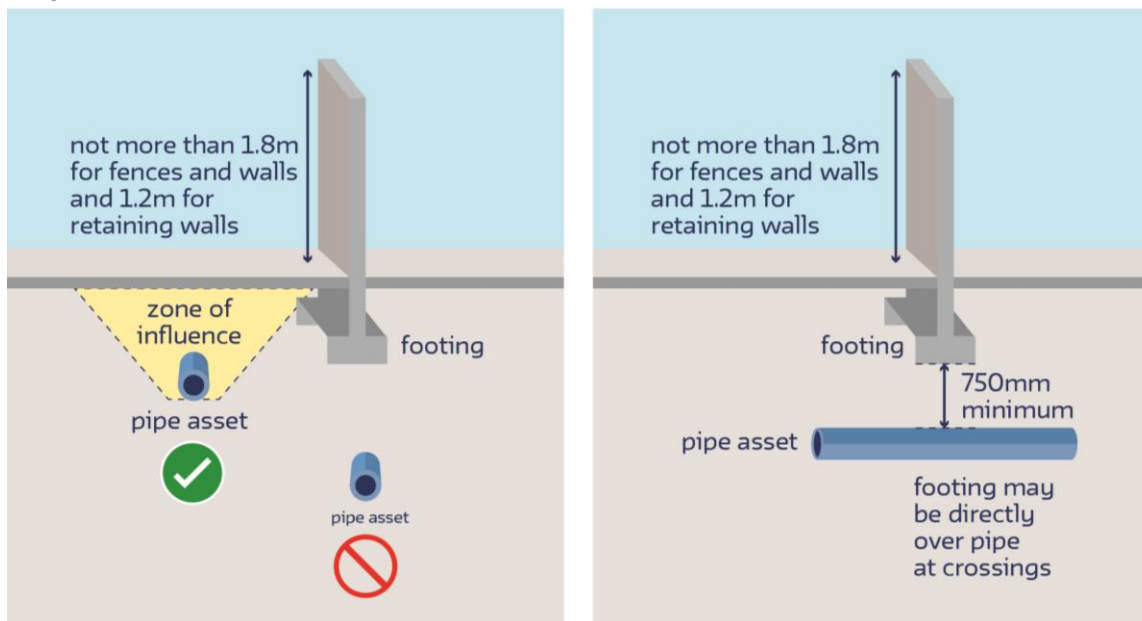


Figure 8 Fences and walls – along assets (left) and crossing assets (right)

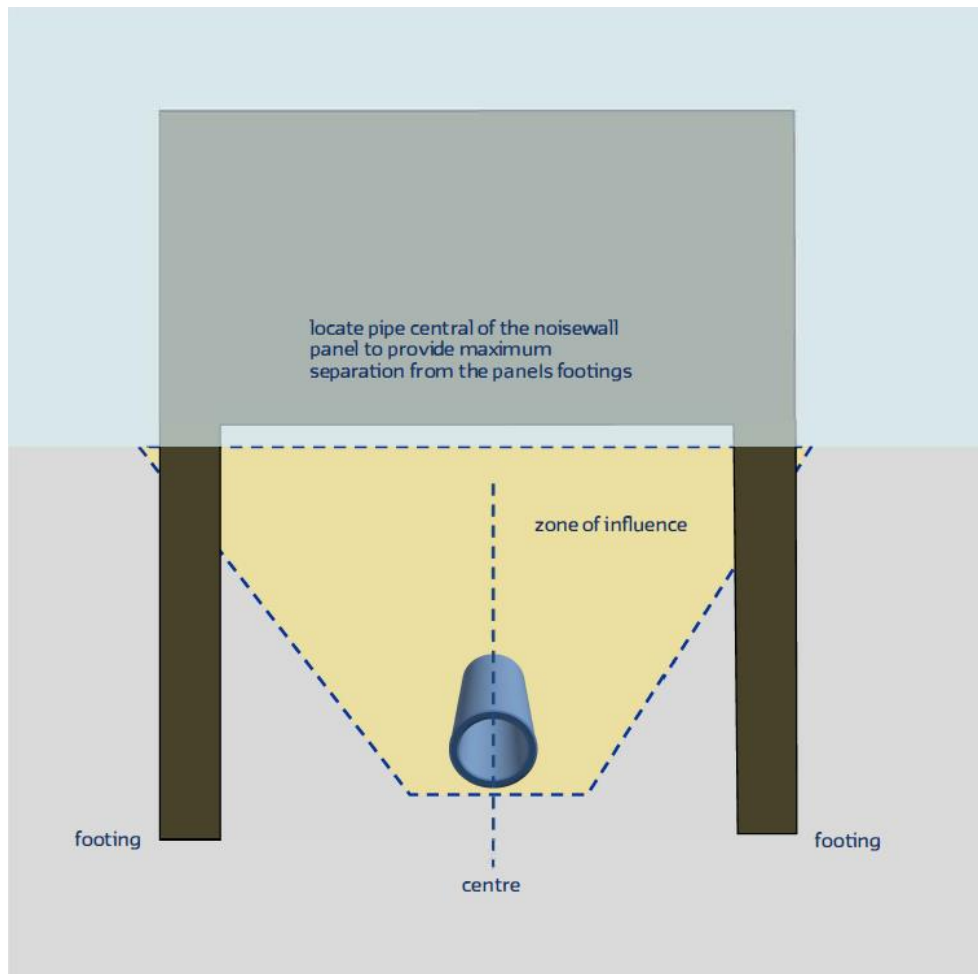


Figure 10 Fences and walls continued

Readily dismantled fences and walls near our assets are exempted from requiring our approval however the following requirements still need to be considered before working near our assets:

- a) Fences and walls parallel to assets are not to be placed within the building restriction zone and should avoid being placed in the zone of influence where possible.
- b) where possible locate the asset centre in order to provide the greatest clearance from the panel footings
- c) Fences and walls crossing assets must:
 - cross at a 90-degree angle to the asset
 - maintain a vertical clearance between the top of asset and any footing of at least 750 mm
- a) not be built directly over maintenance structure covers, valve pit covers and covers associated with all other pipe fittings.
- b) Fences and walls are not to be built directly over sewer and drain maintenance structures and an unconfined access way of at least 1.0 m wide is to be maintained around maintenance structures at all times as per Fig 6.



8.5 Retaining walls

Retaining walls are used where there is a difference in ground levels to prevent the ground from subsiding or eroding away.

Retaining walls can be built from many different types of materials including precast interlocking blocks or materials that are built in situ such as stone, poured concrete, treated timber and brick.

This section covers the requirements for retaining walls that are greater than 1.2 m high*.

* Retaining walls not greater than 1.2 m are treated in the same way as fences and walls – refer to Section 8.4.

** Ground anchors are sometimes used to support retaining walls – refer to Section 8.6 for ground anchor requirements.

Requirements

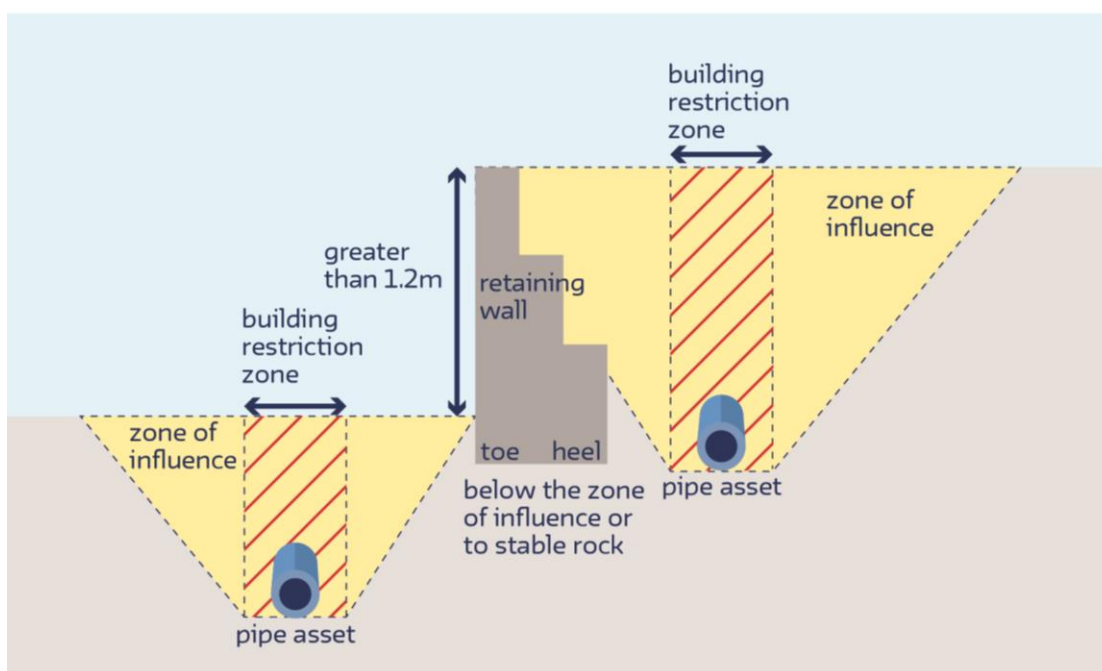


Figure 9 Retaining walls

Retaining walls are generally not allowed within the Prescribed Proximities to any of our pressurised pipelines (this includes water supply pipelines, sewer pressure mains and drainage pressure mains). Where you consider there to be no alternative options, please seek special advice from us.

Retaining walls within the Prescribed Proximities to our sewer reticulation, sewer mains and main drains may be considered subject to the following requirements:

- Retaining walls must be self-supporting within the zone of influence – this is commonly achieved by using foundation supports, such as piles, founded to a depth below the zone of influence or to stable rock (refer to Section 6.3 for guidance on pile design).
- Retaining walls are not to be placed within the building restriction zone.
- Where retaining walls are required to cross-assets they must cross at a 90-degree angle and there must be a vertical clearance between the top of pipe and wall footing of at least 750 mm.



- d) An unconfined access way of at least 1.0 m wide must be maintained around the edge of sewer and drain maintenance structures at all times, as per Figure 6.
- e) Allowance must be made for excavation within the zone of influence to access the asset without undermining the integrity of the retaining wall.
- f) Designs for major retaining walls (such as for bridges) must be completed by a suitably qualified structural design engineer to verify that the asset will not be impacted.

8.6 Ground anchors

Ground anchors are generally not allowed within the Prescribed Proximities to any of our pressurised pipelines (this includes water supply pipelines, sewer pressure mains and drainage pressure mains). Where you consider there to be no alternative options, please seek specialist advice from us.



8.7 Earthworks and alteration of surfaces

The ground cover (depth from ground level to top of the asset) over buried assets provides support and protection from excessive loads and damage.

Earthworks and alteration of surfaces, including removal or placement of soil, gravel, concrete, bitumen and paving, may expose assets to excessive loading.

Reduced cover in ground conditions where the water table is higher than the asset also has the potential to cause flotation. Flotation occurs where there is not enough cover over the pipe to balance the upward force created by the water table.

Requirements

Earthworks and alteration of surfaces within the Prescribed Proximities to our assets (as defined in Table 2) may be considered subject to the following requirements:

8.7.1 Ground cover

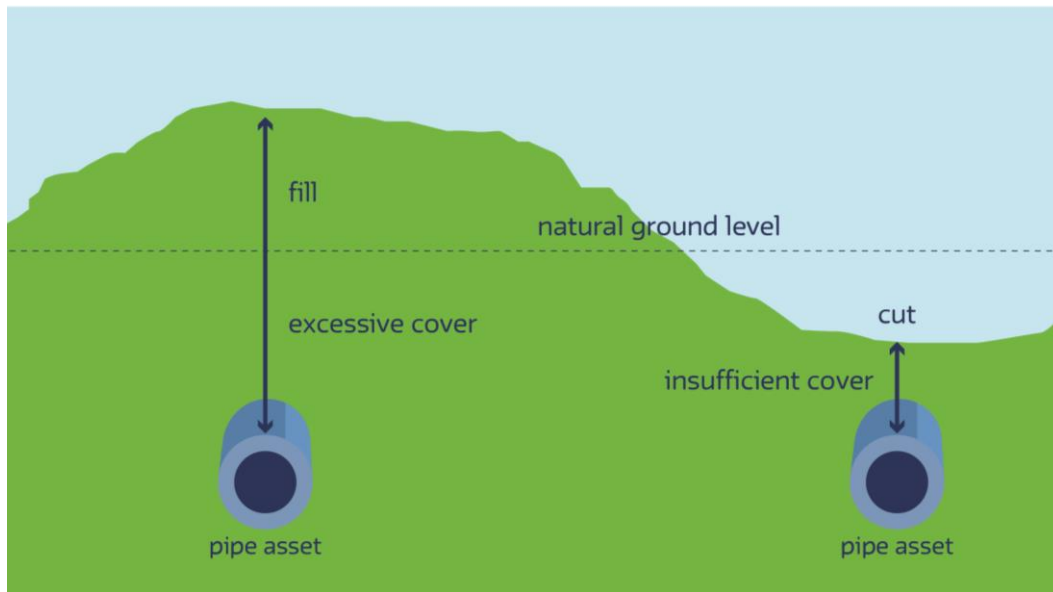


Figure 10 Earthworks and alteration of surfaces

- a) *Minimum cover requirements* – In general, our minimum cover requirements must be achieved at all times.



Table 6 below provides a guide to our minimum cover requirements for different types of assets depending on their location.

The location of the asset determines the type of loading that the asset will be exposed to. This is normally categorised by two main conditions; trafficable and non-trafficable. Refer to our design standards for full details of our cover requirements.



Table 6 Guidance information on our minimum cover requirements for buried assets

Type of asset	Location	Minimum cover*
Trunk and distribution water mains	Road reserves, car parks and other trafficable areas	1,500 mm
	Parklands and other non-trafficable areas	600 mm
Water reticulation	Road reserves, car parks and other trafficable areas	600 mm
	Parklands and other non-trafficable areas	600 mm
Sewer reticulation and sewer mains	Road reserves, car parks and other trafficable areas	900 mm
	Parklands and other non-trafficable areas	750 mm
Sewer and drainage pressure mains	Freeways and other primary distributor roads	1,500 mm
	Other trafficable areas as well as parklands and non-trafficable areas	900 mm
Main drains	Road reserves, car parks and other trafficable areas	900 mm
	Parklands and other non-trafficable areas	750 mm
Residential Service Connections	Road reserves, car parks and other trafficable areas	450 mm
	Parklands and other non-trafficable areas	450 mm

Minimum depth of cover may be required to be locally increased to accommodate the effective heights of the stop valves/gate valves plus the required clearances for the spindle caps below the finished surface level (FSL)

- b) *Box out depths* – cover can be reduced temporarily to 600mm for boxing out purposes in road reserves, car parks and other trafficable areas.
- c) *Maximum cover requirements* – pressurised pipelines generally must not be buried deeper than 2.0 m. Pipelines may need to be raised where maximum cover cannot be achieved.
- d) If you are unable to comply with our cover requirements we may require you to provide an engineering assessment demonstrating that there will be no excessive loadings on our assets otherwise you may be required to raise, lower or relocate the asset. The assessment should take into consideration the condition of our asset which you may choose to confirm via an asset condition assessment.



8.7.2 Pipeline fittings and structure

- a) All maintenance structure covers, valve pit covers and covers associated with all other pipe fittings must be brought to the new finished ground level.

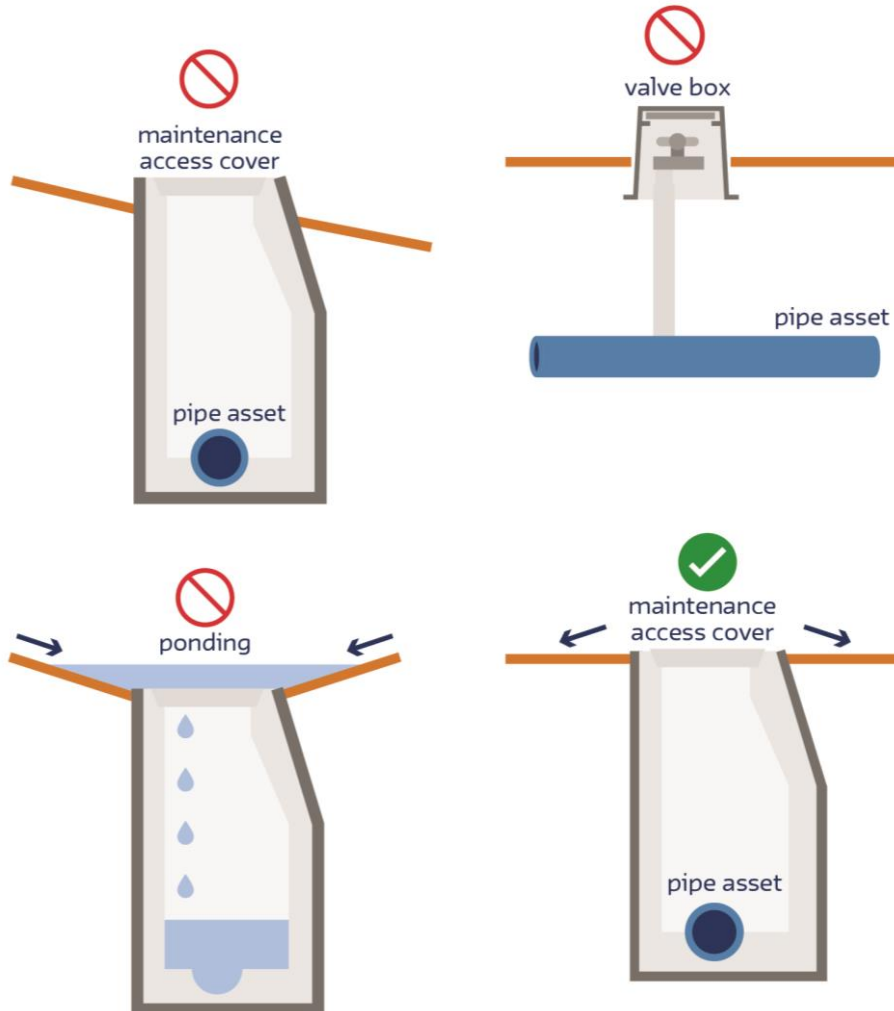


Figure 11 Alteration of surfaces around covers and lids

8.7.3 Other

- a) If a surface is changing from non-trafficable to trafficable we may require you to replace the backfill and embedment material in the trench zone of the asset and replace fitting covers with trafficable covers. Refer to Section 8.13 for more information on road development requirements.
- b) Proposed changes to surface levels must not interfere with overland flow paths or the drainage capacity of existing pipeline scour facilities.



8.8 Movement of heavy vehicles

Heavy vehicles, such as construction equipment or other heavy transport, crossing buried assets can cause damage due to heavy loads and vibration. Even relatively light loads can crack assets if the asset is brittle with shallow cover RC, AC, VC and CI pipelines are particularly susceptible to damage from the movement of heavy vehicles.

Requirements

Movement of heavy vehicles (other than on permanent roads) within the Prescribed Proximities of our assets (as defined in Table 2) may be considered subject to the following requirements:

- a) You must confirm the depth of cover above an asset with potholing – while assets are installed to meet minimum cover requirements to protect them from damage, the cover may have altered since the time of installation due to excavation activities, erosion, or ground subsidence.
- b) Subject to having minimum cover for trafficable conditions (refer



Table 6), vehicles that are legally permitted on public roads are allowed within the Prescribed Proximities.

- c) For heavy construction plant or vehicles that exceed maximum legal load limits (such as piling rigs, cranes and rollers), you may need to provide an engineering assessment demonstrating that there will be no excessive loadings or vibrations on our assets. The assessment should take into consideration the condition of our asset which you may choose to confirm via an asset condition assessment.
- d) The use of protective measures such as increased ground cover above the asset or steel road plates may be permitted where no other viable options are available.
- e) Additional requirements apply if the vehicle loading is to permanently change from non-trafficable to trafficable conditions, refer to Section 8.7 and Section 8.13.



8.9 Dewatering

Dewatering (the removal of ground water from a construction site) has the potential to cause ground subsidence which may affect the stability of buried assets.

Requirements

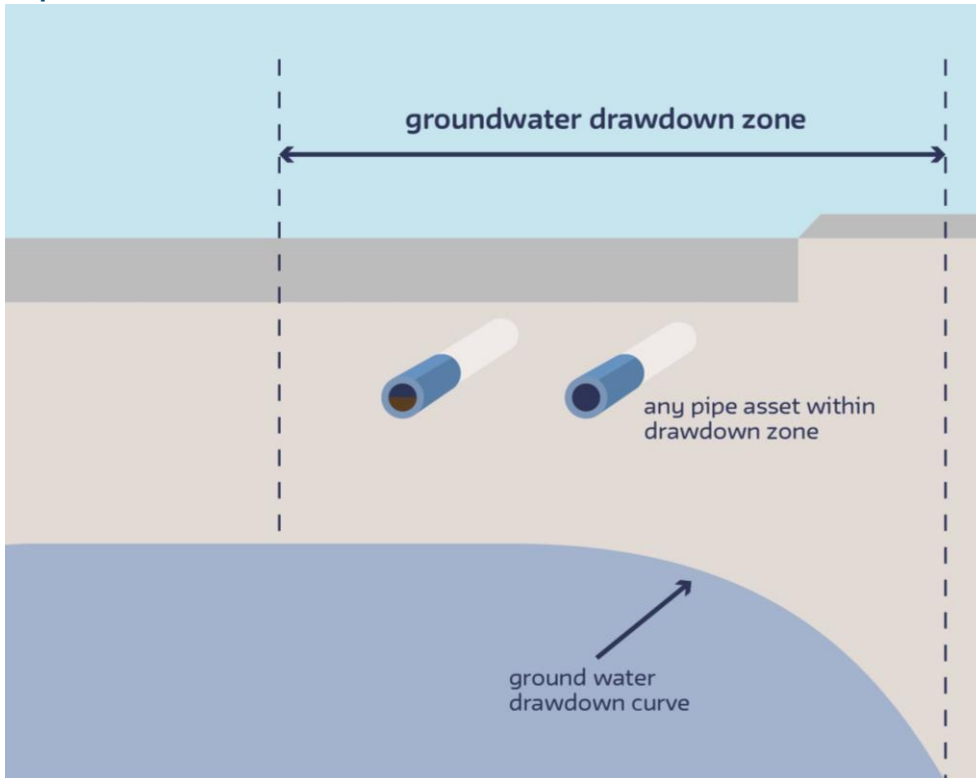


Figure 12 Dewatering

Dewatering or alteration of the water table within the Prescribed Proximities to our assets (as defined in Table 2) may be considered if you can demonstrate that there will be no impact on our assets.

Generally we require you to address the risks to our assets in a dewatering management plan which should include information about:

- a) purpose of dewatering (an explanation of why dewatering is necessary)
- b) dewatering technique (including wellpoint, deep well, open hole)
- c) anticipated dewatering flow rate and total dewatering duration
- d) measures and techniques to manage geotechnical stability issues
- e) contingency plans in case of any emergency situation.



8.10 Vibrations

Excessive vibrations can cause direct damage to our assets, such as damage of pipe joints or cracking of brittle pipes (AC, RC, VC and CI), or can cause soil subsidence resulting in the collapse of our assets.

Common types of work that generate excessive vibrations include:

- vibratory ground compaction
- movement of heavy vehicles (also see Section 8.8 Movement of heavy)
- blasting
- demolition works
- pile driving and boring.

The risk of vibration at the asset will vary depending on several factors including the size of the vibrations, asset condition, ground conditions, and distance from the source of vibration.

Requirements

Work that creates excessive vibrations within the Prescribed Proximities to our assets (as defined in Table 2) may be considered subject to the following requirements:

- a) Where possible use low vibration work methods and control vibration at the source – consider substituting equipment that creates large amounts of vibrations for equipment that generates lesser vibrations, including:

Vibratory ground compaction equipment

- The use of light rollers, plate compactors and tampers over the use of heavy vibratory rollers is preferred – light rollers, plate compactors and tampers, working in layers of 300 mm, are generally permitted within the Prescribed Proximities.
- The use of static compaction equipment over vibratory compaction equipment.
- Working in shallower layers.

Piling – the use of bored piles over the use of driven piles.

Blasting – blasting near our assets is to be avoided whenever possible; non-explosive methods or rock breaking is preferred.

- Where explosive methods cannot be avoided you must provide us with a blast plan that includes an engineering assessment of the impact of the blast on nearby assets and proposed risk mitigation actions.

- b) During significant vibratory works we may require you to:

- perform an asset condition assessment to confirm the condition of our asset prior to you starting work
- undertake prior testing of vibrations to establish safe limits for the specific conditions of the work
- undertake continuous monitoring of vibrations and asset condition during the work



- adhere to safe vibrations limits (peak particle velocities) which we may specify for a particular asset – in general, the maximum vibrations at the asset shall not exceed the limits provided in Table 7 below.

Table 7 Safe vibration limits (PPV), refer to British Standard 5228-2:2009 Code of Practice for noise and vibration control on construction and open sites, part 2 Vibration

Vibration type	Safe PPV limit for brittle pipelines (AC, RC, VC, CI)	Safe PPV limit for other pipelines
Continuous vibration	2 mm/s maximum	15 mm/s maximum
Intermittent or transient	5 mm/s maximum	30 mm/s maximum



8.11 Excavations

An excavation is any operation in which earth, rock or other material in the ground is moved, removed or otherwise displaced using tools, machinery or explosives. Excavations can be open or trenchless.

Excavations of all types can cause damage from excavation equipment directly impacting our assets or may affect the stability of our assets by undermining the assets bedding and support material.

The risk of damage increases with more extensive excavations and larger machinery, or for excavations near brittle pipe materials (AC, VC, RC and CI) which can be more easily damaged.

AC, RC and VC pipelines are assembled from short pipe lengths. Any differential soil movement can damage these joints causing a leak or burst.

8.11.1 Open excavations

Open excavation work generally means work involving the removal of soil or rock from a site to form an open face, hole or cavity using tools, machinery or explosives.

Requirements

Open excavations within the Prescribed Proximities of our assets will be considered subject to the following requirements:

- a) Any deep excavation (i.e. deeper than the asset or 1200mm, whichever is the lesser) where its zone of influence passes under the asset, is required to have ground support system such as shoring in use. Serious consideration should also be given to having the asset temporarily taken offline during the works to prevent any possible inundation.

When shoring is installed, it is a requirement to ensure that no ground movement/subsidence occurs on removal particularly in proximity of AC, RC & VC mains.

If the main is to be taken offline the following applies:

For pressure pipe:

- (i) The main is to be depressurised during the duration of the works, by isolation or temporarily cutting and capping the main on either side of the excavation, in an area outside of the zone of influence of the excavation.
- (ii) Depending on the specific location, a temporary bypass main and temporary services may be required.

For gravity pipe:

- (i) An approved plug is to be installed upstream of the excavation in an area outside of the zone of influence of the excavation.
- (ii) Depending on the specific location, tankering and temporary services may be required.

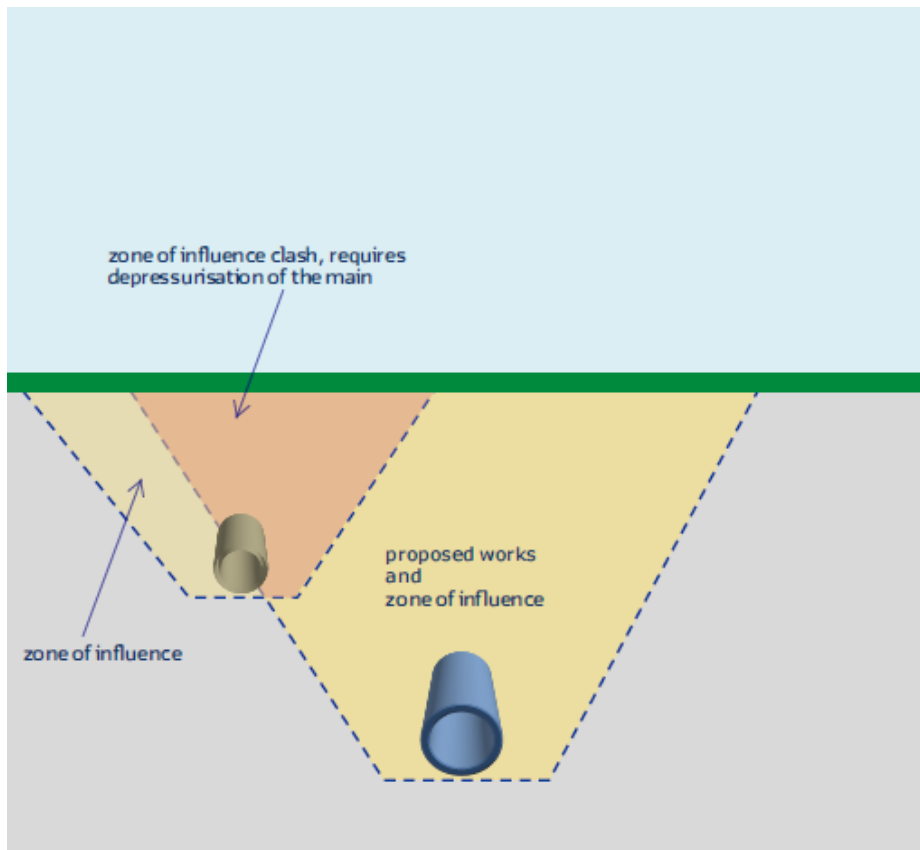


Figure 13 Open excavations – circumstances for depressurisation

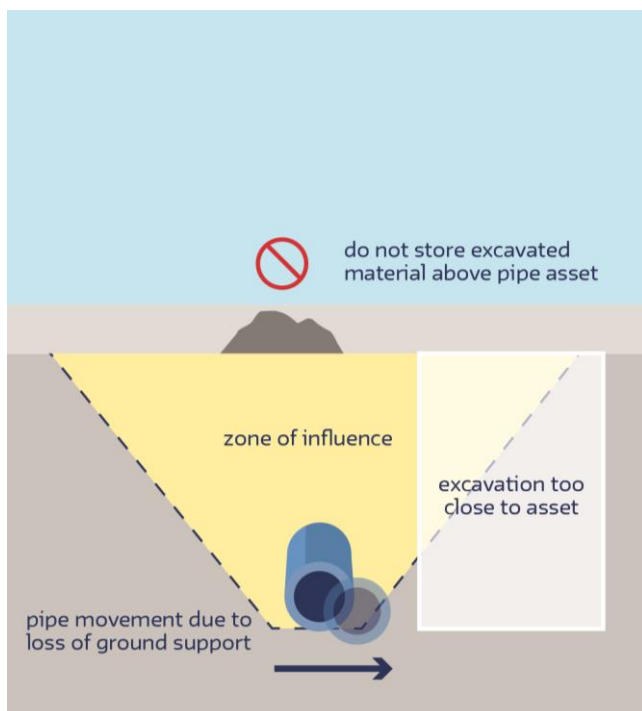


Figure 14 Open excavations – not acceptable

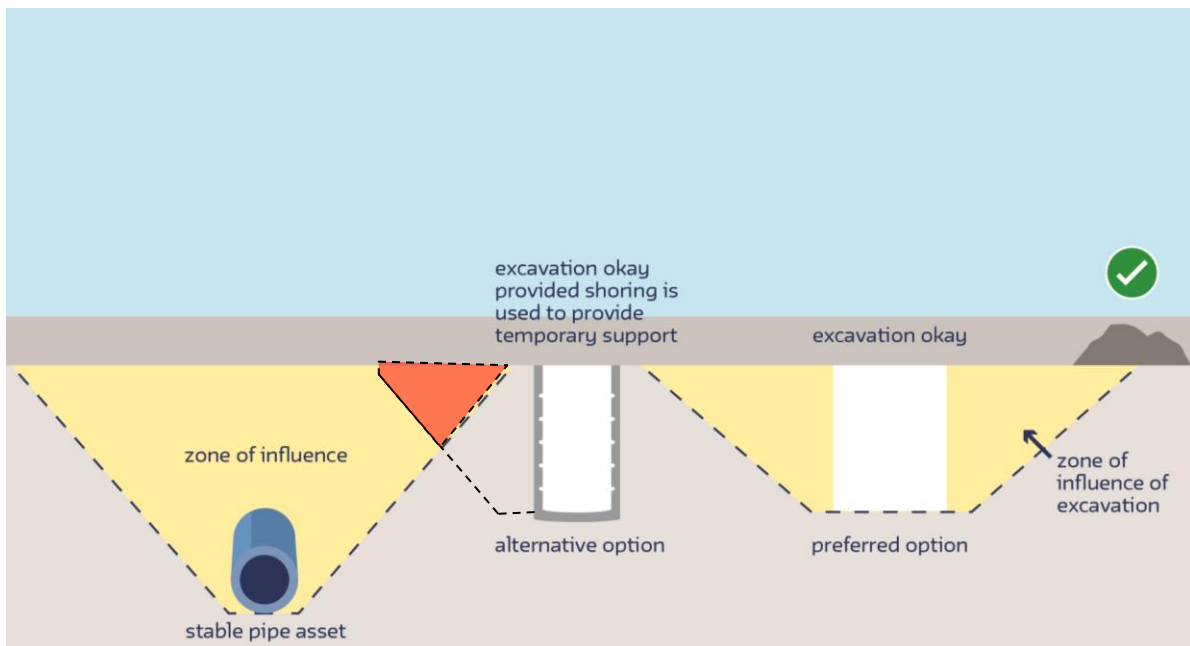


Figure 15 Cont. Open excavations – acceptable

- b) Buried assets must not be exposed; at least 500 mm cover is maintained at all times including during road box-out – though a minimal exposure is acceptable, such as for service crossings and if only the top of the pipeline is exposed or where actual cover has to be established

Establishment of actual cover is to be carried out prior to the works commencing via potholing, preferably by vacuum excavation techniques

- c) Thrust blocks restrain thrust forces in pressurised pipelines and are commonly found at pipeline fittings and changes in pipeline size and direction – thrust blocks and the ground supporting them should never be disturbed as this could cause sudden failure of the asset.
- d) Excavation of acid sulphate soils can cause damage to assets through corrosion, in particular steel pipelines – we may require you to address the risks and management controls to our assets in your acid sulphate soils management plan.
- e) Details of proposed work methods (including excavation equipment) and details of any assets that need to be exposed (such as length of pipeline and duration of time pipeline will be exposed for) must be provided.
- f) *Backfilling and reinstatement* – our pipelines are installed in compacted bedding, selected fill and support material which is part of the pipeline design. Where pipelines are exposed we require you to backfill and reinstate the pipeline to our standards.
- Unsaturated soil – the first 200 mm cover above the pipe shall be sand containing stones no greater than 14 mm and no sharp edges. This shall be compacted by tamping to ensure no voids exist around the pipe. The remaining volume can be filled with the existing soil, free of any road base, rocks greater than 50 mm or other foreign matter. This shall be filled in 300 mm lifts with 4 to 6 passes with a small plate compactor (such as a 300 mm plate compactor) on each lift.
 - Saturated soil – when pipelines in saturated soils are exposed, it is preferred that the excavation is dewatered so that backfilling and compaction can be done using unsaturated soil. Where dewatering is not feasible, cement stabilisation may be



permitted. In this instance cement stabilised sand (sand:cement ratio no stronger than 20:1 by volume) must be used to 200 mm above the pipe. This is to be compacted by tamping to ensure there are no voids around the pipe. The remaining volume is to be filled in 300 mm lifts with 4 to 6 passes with a small plate compactor on each lift.

- Surfaces shall be reinstated as required by the local authority – refer to Restoration and Reinstatement Specification for Local Governments which is available from the [Main Roads Western Australia website](#).

g) We may require an inspection by one of our representatives before backfilling takes place and may require compaction test results.

8.11.2 Trenchless excavations

Trenchless excavation is becoming increasingly used for laying and renovating underground services, particularly where there is a need to avoid surface disruption. Trenchless excavations cause minimal disturbance to soil and surface infrastructure such as to road surfaces and pavements compared to open excavations. These types of excavations however pose a great risk to underground services. Care should be taken when using trenchless methods to avoid colliding with our assets.

Requirements

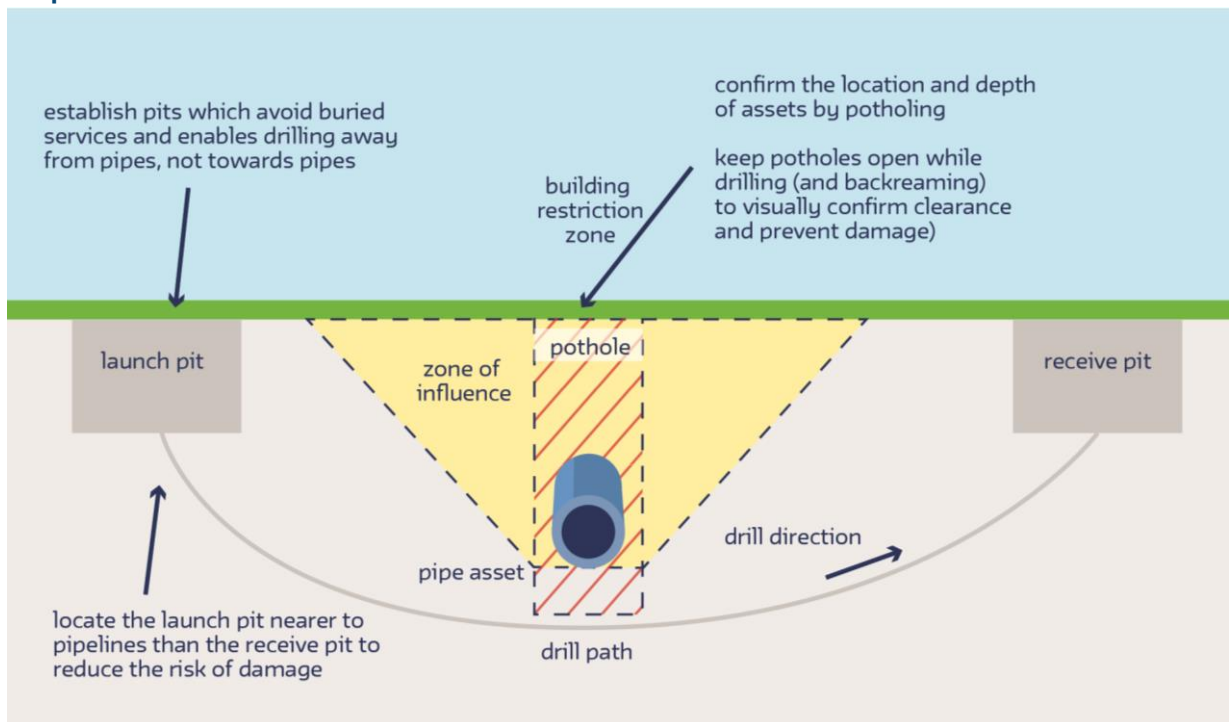


Figure 16 Trenchless excavations

Trenchless excavations within the Prescribed Proximities to our assets (as defined in Table 2) will be considered subject to the following requirements:

- a) Details of proposed work methods must be provided, including:
- type of trenchless installation equipment
 - bore diameter
 - ground conditions



- the accuracy and reliability of the technique or equipment being used
 - proposed drill site and drill path
 - details of the affected assets (including clearance between drill path and asset).
- b) Potholing must be used to positively locate all underground assets to ensure adequate clearances are maintained between assets (refer Section 8.12 for clearances). Potholing at each asset crossing and at regular spacing along parallel assets is recommended. All buried assets that are cross or parallel within 1 meter of the drill path should be exposed.
- c) Where trenchless excavations cross pipelines, the launch pit (rather than the receive pit), should be located nearest to the most significant pipeline if possible – see Figure 16 above.
- d) The depth of the installed utility must be proven at all pipeline crossing points.
- e) Continuously monitor the path and depth of the drill head, including during back reaming where the path of the drill head may deviate from the original path. Potholes are to be kept open to monitor the progress of the drill head near assets and to ensure clearance distances are maintained.
- f) An asset condition assessment may need to be undertaken upon completion of the work.



8.12 Service installations

Maintaining adequate clearances to other underground services is essential to reducing the risks of service installation on our assets. This includes the installation of underground services as well as overhead services.

Requirements

Applications for service installations within the Prescribed Proximities to our assets (as defined in Table 2) may be considered subject to the following requirements:

8.12.1 Underground services

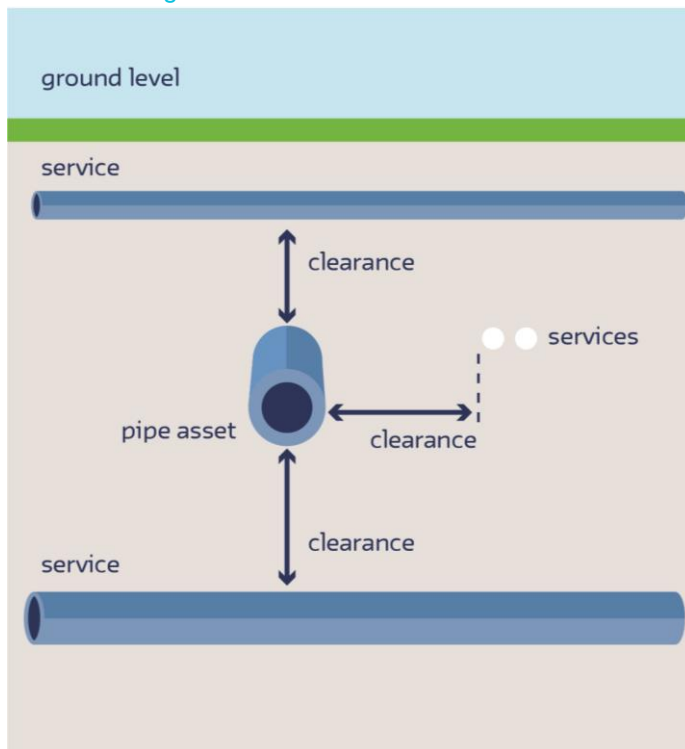


Figure 17 Underground service installations

a) *Services crossing our assets*

- Crossings should be made at, or close to, right angles to our assets, with the exception of minor private water and stormwater drainage pipes.
- Each crossing point must be potholed to confirm the location of our asset – for trenchless excavations the pothole must extend deep enough to visually see the installation equipment just prior to it going over or underneath our asset.
- The following minimum vertical clearances shall be observed:



Table 8 Minimum clearance requirements for service crossings

Diameter of our asset	Minimum clearance for service crossings installed by open excavation	Minimum clearance for service crossings installed by trenchless excavation
Less than 300mm	At least 150 mm	At least 150 mm ± equipment accuracy (mm)
300 mm or greater	At least 300 mm	At least 300 mm ± equipment accuracy (mm)

b) *Services parallel to our assets*

- Services in road reserves should be installed on their standard alignments specified in the [Utility Providers Code of Practice](#)

c) *Electrical, gas and telecommunication*

- Electrical, gas and telecommunication services installed near our assets may present a risk to our maintenance personnel – these services are to be clearly marked and where required provided with suitable protection – this may include concrete slabs laid 200 mm above the services, and buried labelled marker tape above the slabs and along the service.
- High voltage power lines in the vicinity of metallic pipelines must be assessed for AC interference hazards in accordance with requirements of Water Corporation design standard DS23 Pipeline AC Interference and Substation Earthing.



8.12.2 Overhead services

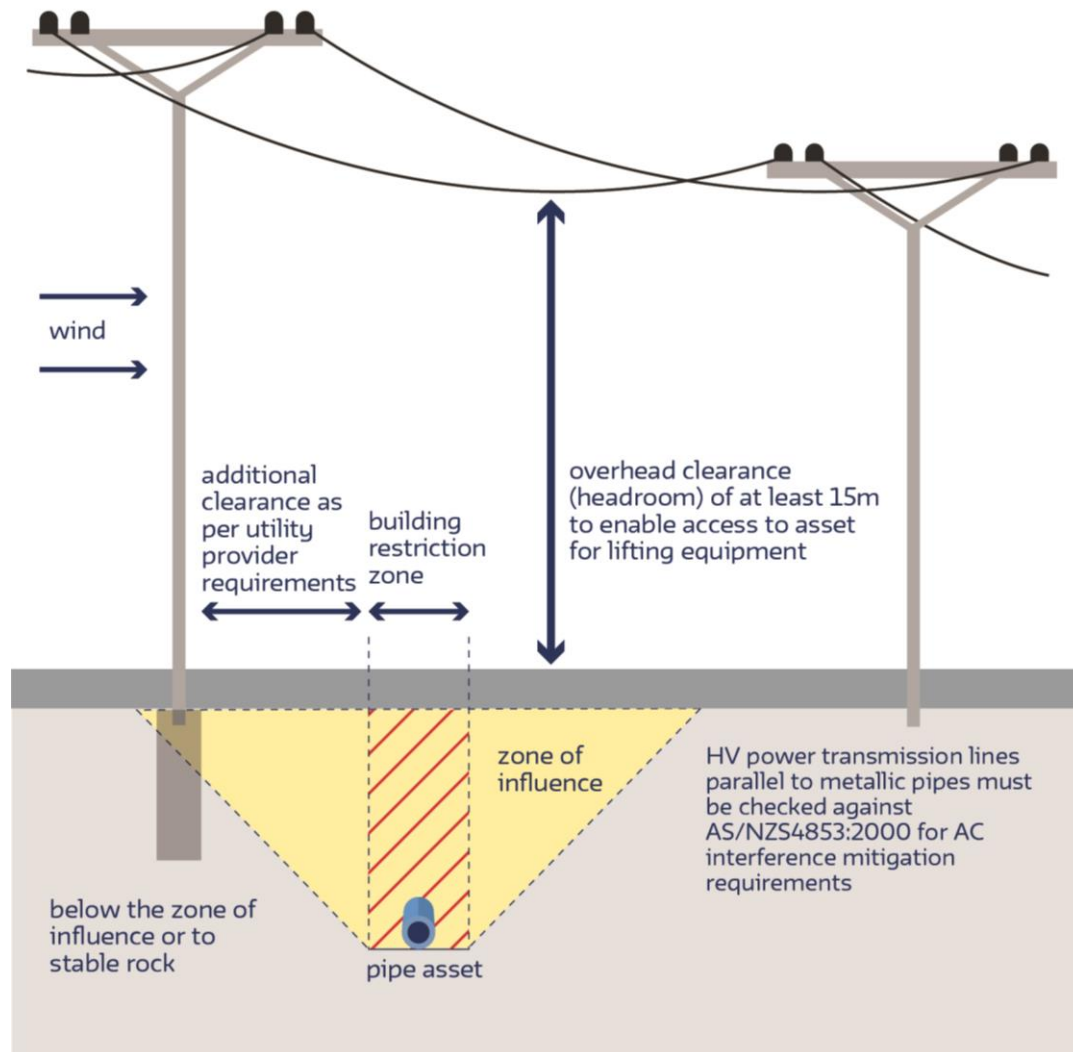


Figure 18 Overhead service installations

- A headroom (distance between ground level and overhead lines) of at least 15 m or as per Western Power guidelines (whichever is the greater) is to be allowed for to enable safe access for lifting equipment.
- Poles and other structures associated with overhead services that are under heavy loading and/or cannot be readily removed must be self-supporting within the zone of influence – this can be achieved using foundation supports such as piles which extend to a depth below the zone of influence or to stable rock (refer to Section 6.3 for guidance on pile design).
- Poles and other structures associated with overhead services are not to be placed inside the building restriction zone.
- High voltage power lines in the vicinity of metallic pipelines must be assessed for AC interference hazards in accordance with requirements of Water Corporation design standard DS23 Pipeline AC Interference and Substation Earthing.



8.13 Road development

Road development includes any proposed creation or alteration of public and private roads.

Requirements

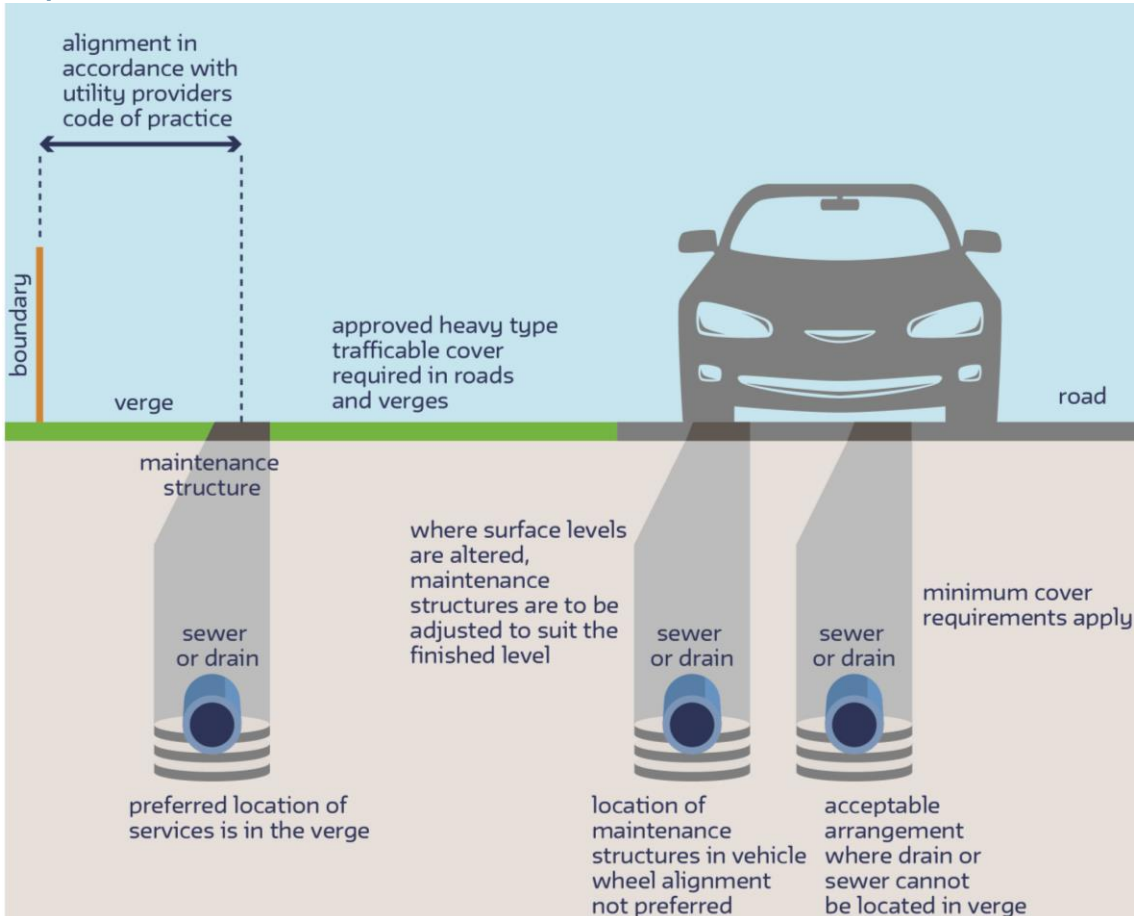


Figure 19 Road development

Road development applications within the Prescribed Proximities to our assets (as defined in Table 2) may be considered subject to the following requirements:

- The location for pipelines is in the road verge on the standard alignments specified in the [Utility Providers Code of Practice](#).
- Pressurised pipelines (this includes water supply pipelines, sewer pressure mains and drainage pressure mains) are not to be placed beneath the road pavements except for at road crossing and any relocations are to be placed, if possible, on the current 2.1m alignment.
- Sewer reticulation, sewer mains and main drains may be allowed beneath road pavements provided all maintenance structure covers are located outside vehicle wheel alignments and are fitted with trafficable covers.

8.1.2 Road crossings

- Road crossings must be made at 90-degree angles to the road.



- b) Road crossings must achieve our minimum ground cover requirements for trafficable conditions (see Section 8.7 for details).
- c) Levels achieved during boxing out operations are to conform to minimum cover requirements as per Table 6 (section 8.7)
- d) Depending on the criticality of our asset and classification of the road we may require pipelines to be placed in sleeves or tunnels – this is usually mandated where critical assets cross major roads (refer to Section 6.3 for further design guidance).
- e) Prior to the development of roads or installation of sleeves, pipe joints for existing steel pipelines may need additional protection in accordance with Design Standard 60 (for example single welded joints may need to be converted to double-welded joints prior to either placing into a sleeve or constructing a road over).



8.14 Planting and removing trees

Care must be taken in the planting and removal of trees.

Trees and shrubs rely on their roots to find moisture and nutrients and our assets are an attractive moisture source. Tree roots can penetrate into assets through joints, damaged sections of pipes or maintenance structures, causing blockages and subsequent overflows.

Trees can also cause damage to assets as a result of movement such as during a storm or when a tree is removed.

The risk of damage depends on the type and size of the tree, and the type of asset affected. Some assets are more susceptible to damage by trees than others, such as AC, RC and VC pipelines.

Some tree species have large and expansive root systems which can still cause damage even if the tree is not located near to underground assets.

Requirements

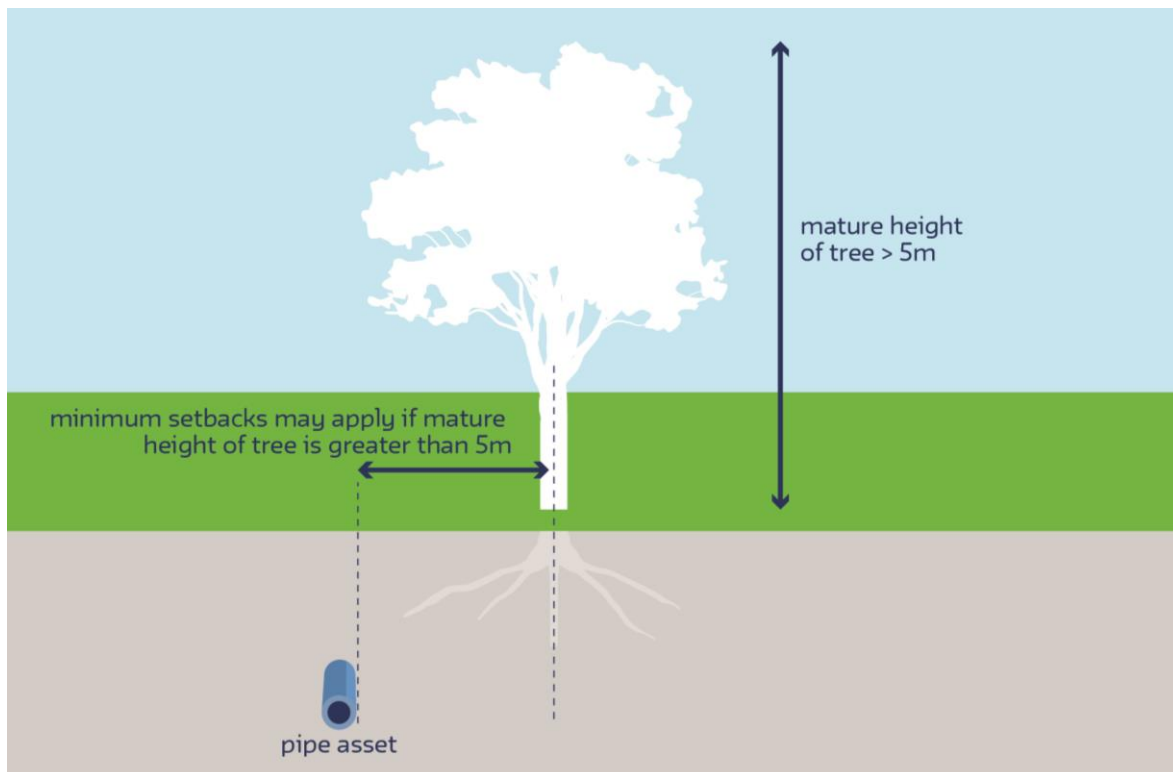


Figure 20 Tree planting

Planting and removal of trees (other than by cutting down and stump grinding) with a mature height of greater than 5 m within the Prescribed Proximities to our assets (as defined in Table 2) require our approval.

Planting and removal of trees smaller than 5 m are exempted, except in the case where they are over critical assets whereupon formal permission is required.

In all situations consideration should be given to the following requirements:

- Before planting or removing a tree consider the tree height, expanse of the root system and related risk of damaging assets.



- b) For any trees or shrubs planted near an asset we recommend using a root barrier to restrict root growth in the direction of the asset.
- c) Refer to [Select the right tree](#) for information on common plants and information about their mature height ranges and recommended minimum planting distances from assets.
- d) Minimum setbacks may apply for trees with a mature height of greater than 5 m.

8.15 Installing equipment on our assets

Common requests to install equipment on our assets include installation of telecommunications antennas on our water tanks or towers to avoid building other structures.

Requirements

Installation of equipment on our assets always requires approval. Applications may be considered subject to the following requirements:

- a) The equipment does not compromise the integrity of our asset – for example, welding brackets to a tank may risk damaging the interior coating of the tank.
- b) The equipment does not present potential safety hazards – for example, equipment cables draped across walkways may present a trip hazard.
- c) The equipment is adequately supported to withstand dead loading (loading from the equipment itself) as well as live loading (such as from the wind) – for example, improperly designed brackets can buckle the tank during high winds.
- d) The equipment does not prevent future maintenance of the asset – for example, poor positioning of equipment may prevent access to vents and manholes.



8.16 Key infrastructure

Key infrastructure includes freeways, highways, main roads, bridges, tunnels, railways as well as major building developments.

Requirements

Key infrastructure activities within the Prescribed Proximities to our assets (as defined in Table 2) are assessed case by case.

It is always advisable to undertake early consultation with us regarding the development of key transport infrastructure. This allows the design and safety issues to be identified and incorporated at an early stage, reducing the need for ongoing iterations, costs and delays to your project. Early consultation will also allow you to determine what expert advice and input might be needed in the development of your design, such as geotechnical investigations.

Consideration should always be given to the following when developing your design:

- How to ensure adequate access to our assets for future maintenance, repairs or replacements without presenting a risk to key transport infrastructure or our assets.
- Depending on the criticality of our asset we may require pipelines to be placed in sleeves or tunnels – this is usually mandated where critical assets cross major transport infrastructure (refer to Section 6.3 for further guidance).
- How to reduce the risk of our assets being impacted by your work, for example protecting assets from vibrations generated by heavy vehicle.
- How to ensure the impacts and consequences of assets bursts or failure on key transport infrastructure are minimised.
- Also refer to *AS4799-2000 Installation of underground utility services and pipelines within railway boundaries*.

All designs which affect our assets must be in submitted in accordance with the relevant Water Corporation Standards (DS80 – WCX CAD Standard) and be submitted in accordance with the process outlined in the Developer's Manual

The Water Corporation Also has a list of prequalified Engineering Consultants, who are aware of all the Corporation's design requirements and can assist in your design.

Please note that Freeway crossings need prior approval by MRD-WA and Rail crossings by PTA and ARC, and it is the Design Engineer to organise for agreements between the parties to be signed prior to approved designs being accepted by the Water Corporation.



9. Appendices

- Appendix 1 Work planning checklist
- Appendix 2 Zones around our assets - for buildings and structures
- Appendix 3 Guidelines for enclosing sewers in tunnels

Working near Water Corporation assets planning checklist



Use this planning checklist to help with planning your work to prevent damage to our assets. This checklist lists typical items that should be considered during any project and relates to Water Corporation assets only. This list may not cover all aspects of your work and should be adapted to fully suit the needs of your circumstances.

Job planning item	Comments
Define the work area/boundary.	
Request plans from DBYD at www.1100.com.au (this will identify Water Corporation and other DBYD members' plans but not necessarily all buried infrastructure).	
Request plans from other asset owners if applicable (i.e. Non-DBYD members).	
Receive all asset owners' plans.	
Review and understand all plans and identify the details which relate to your work.	
Seek additional information or clarification from Water Corporation if necessary.	
Conduct your own asset protection risk assessment to determine whether your work presents a risk of damaging our assets.	
If your work presents a risk of damage, consider what options are available to reduce these risks to allow the work to be carried out safely – consider (in order of preference): <ol style="list-style-type: none"> 1) Redesigning your work 2) Relocating our assets 3) Protecting our assets 	
Pothole to confirm the exact location of assets that are near your work.	
Develop your work plans and safe work methods referencing our Technical Guidelines to ensure our assets will not be damaged – work near our assets must meet our technical requirements.	
Determine if Water Corporation approval is required – if you cannot work outside our Prescribed Proximities then you are required to obtain approval from us.	
Request approval from us	
Receive approval from us.	

Working near Water Corporation assets planning checklist



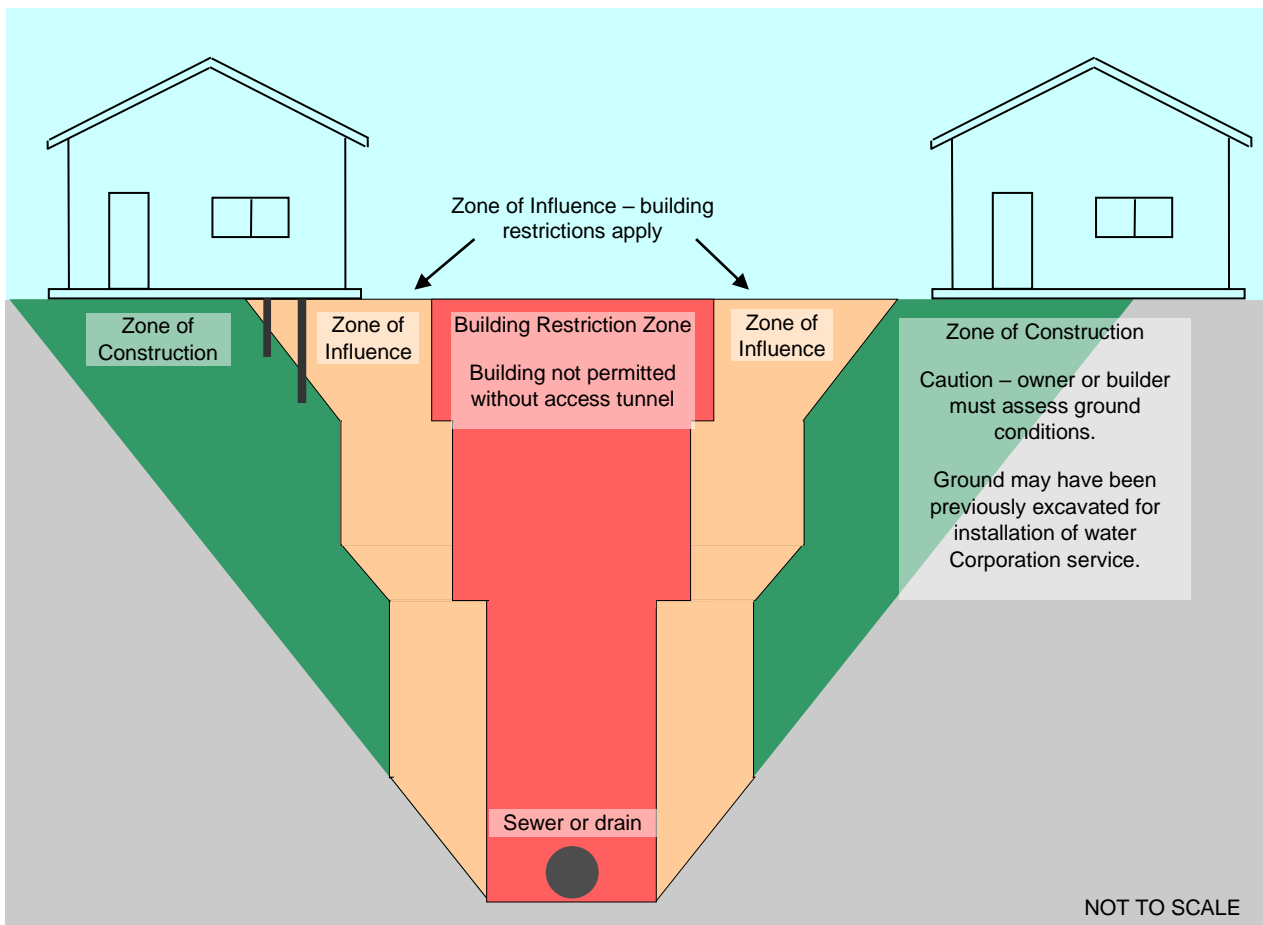
Conduct a site meeting with one of our representatives at project start-up.	
Establish arrangements for site marking and protection of assets (such as signage, bunting, barricades).	
Plan and conduct a briefing for site crews – typical items that should be covered include: <ul style="list-style-type: none"> ▪ Pipeline locations ▪ Damage risks and protection actions ▪ Work methods to be used or modified (such as compaction methods, potholing) ▪ Compliance, control requirements (such as the use of excavation spotter) ▪ Site information pack (including utility maps and work permits) ▪ Arrangements for handover to alternative crews 	
Ensure site-related information and utility maps are current (especially if there is a delay between planning and construction).	
Commence work.	
Ensure utility maps, work clearances and any other related information is on-site at all times.	
Review any asset protection issues which come up during the work for future improvements to your work procedures.	
Plan and conduct any required work to be undertaken by/with Water Corporation (such as progress meetings, inspections, isolations, connections).	
Where required, provide as-constructed details for completed works to Water Corporation.	
Conduct a project close-out meeting with one of our representatives.	



Appendix 2: Zones around our assets – for buildings and structures

The following graphs have been developed to define the zone of influence and building restriction zone for **sewer reticulation, sewer mains** and **main drains** in the context of residential, commercial and industrial buildings and structures (refer to Sections 8.1 and 8.2).

For all other types of work, the zone of influence can be determined using Figure 4 in Section 7 as a guide, except for where we request you to engage a suitably qualified geotechnical design engineer to determine the zone of influence which may be required if your building work presents a high risk.

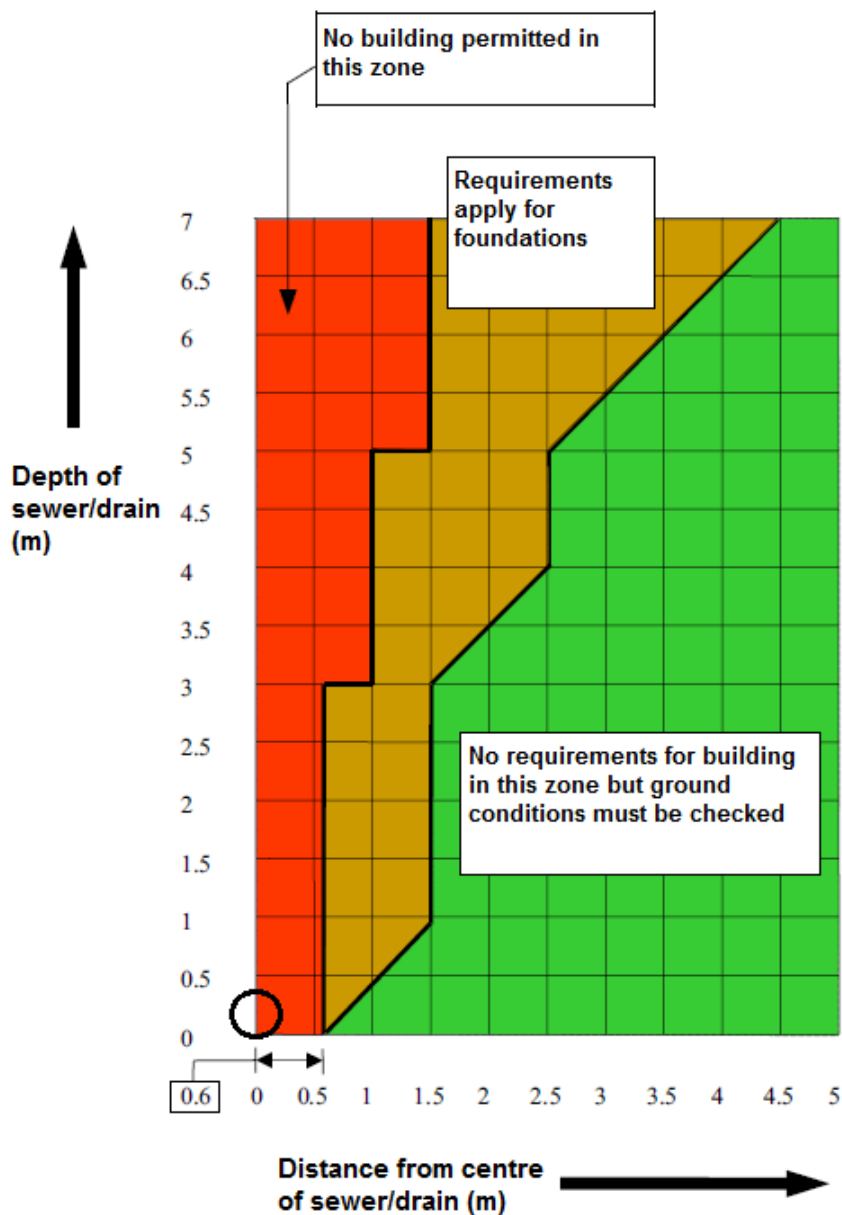




Graph 1 – Single storey structures and multi-storey structures

Proposed Structure Type	Sewer/Drain Concrete Encased		Sewer/Drain Diameter (mm)			Sewer/Drain Pipe Material			
	No	Yes	150	225	300 - 600	PVC	VC	AC	All
Single storey									
Multi-storey									

Shading denotes the situation that applies

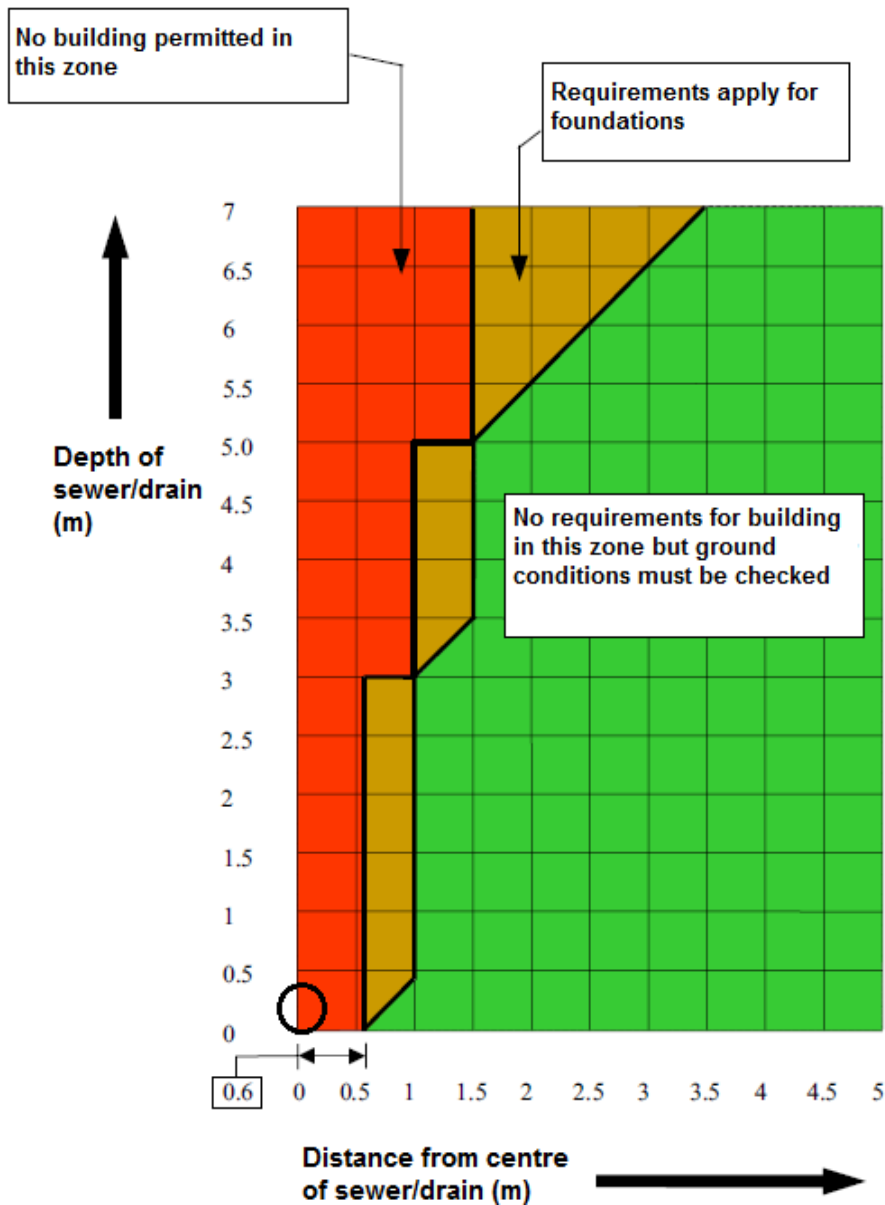




Graph 2 – Single storey structures and multi-storey structures

Proposed Structure Type	Sewer/Drain Details								
	Concrete Encased		Diameter (mm)			Material			
	No	Yes	150	225	300 - 600	PVC	VC	AC	All
Single storey									

Shading denotes the situation that applies

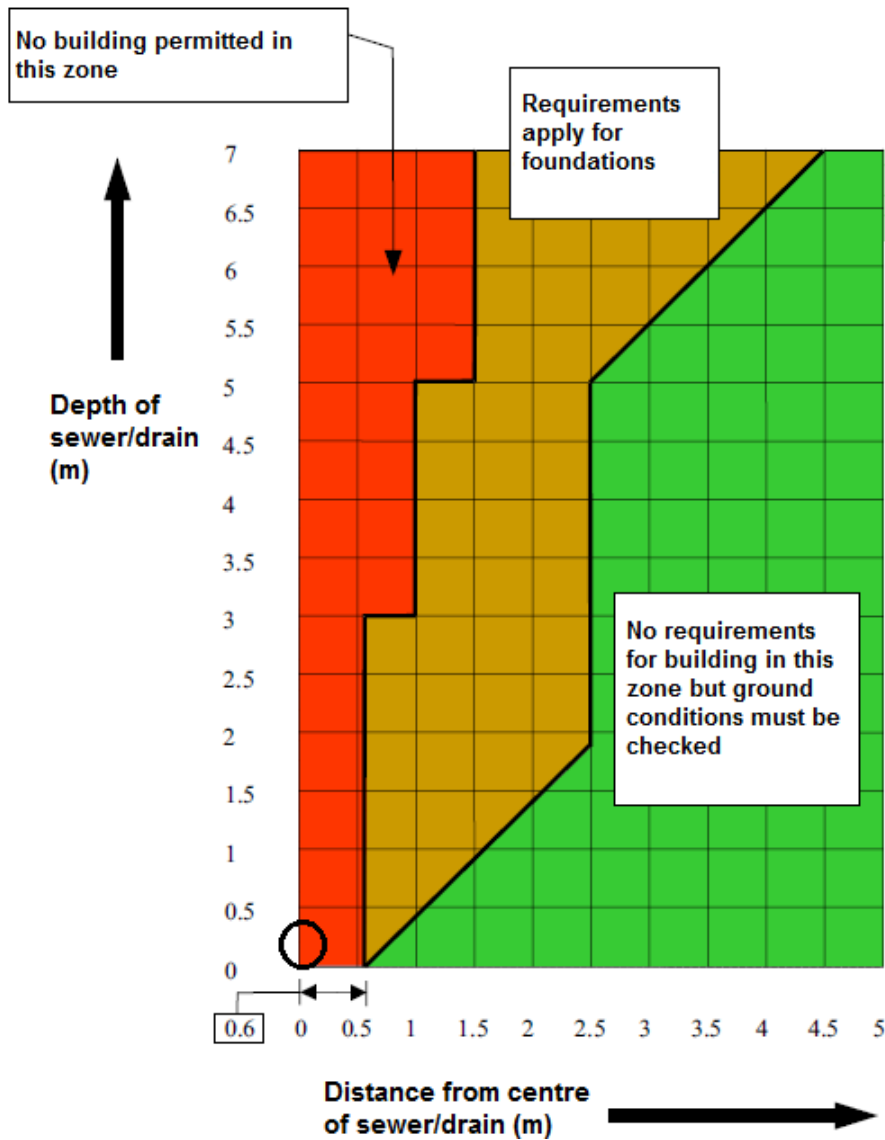




Graph 3 – Single storey structures and multi-storey structures

Proposed Structure Type	Sewer/Drain Details								
	Concrete Encased		Diameter (mm)			Material			
	No	Yes	150	225	300 - 600	PVC	VC	AC	All
Single storey									
Multi-storey									

Shading denotes the situation that applies

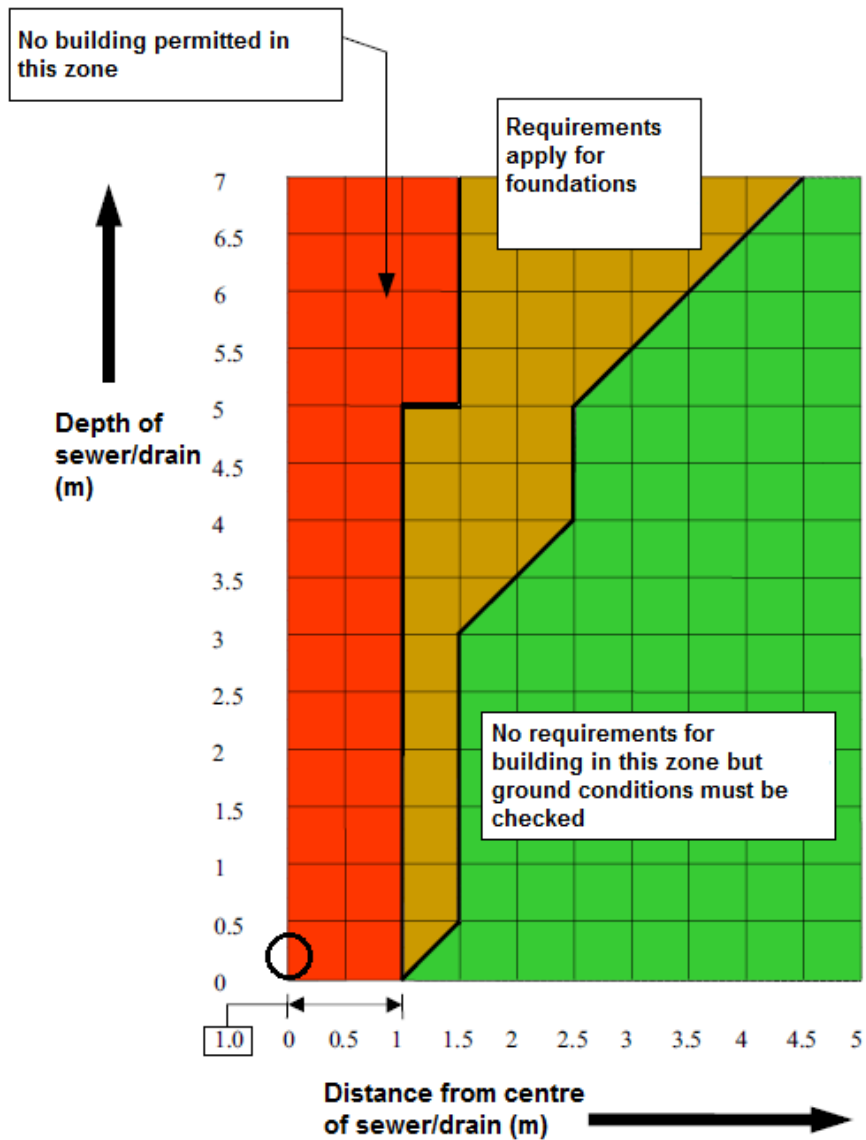




Graph 4 – Single storey structures and multi-storey structures

Proposed Structure Type	Sewer/Drain Details								
	Concrete Encased		Diameter (mm)			Pipe Material			
	No	Yes	150	225	300 - 600	PVC	VC	AC	All
Single storey									

Shading denotes the situation that applies

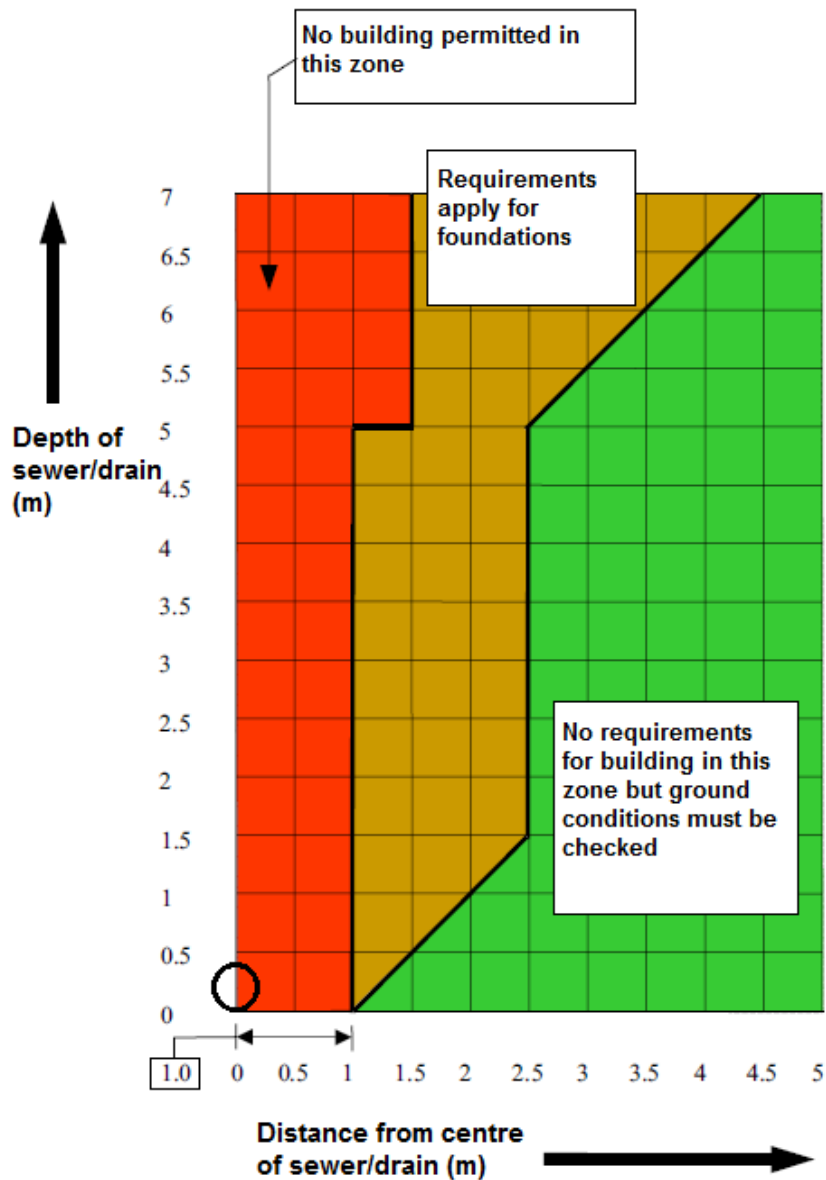




Graph 5 – Single storey structures and multi-storey structures

Proposed Structure Type	Sewer/Drain Details								
	Concrete Encased		Diameter (mm)			Material			
	No	Yes	150	225	300 - 600	PVC	VC	AC	All
Single storey									
Multi-storey									


Shading denotes the situation that applies

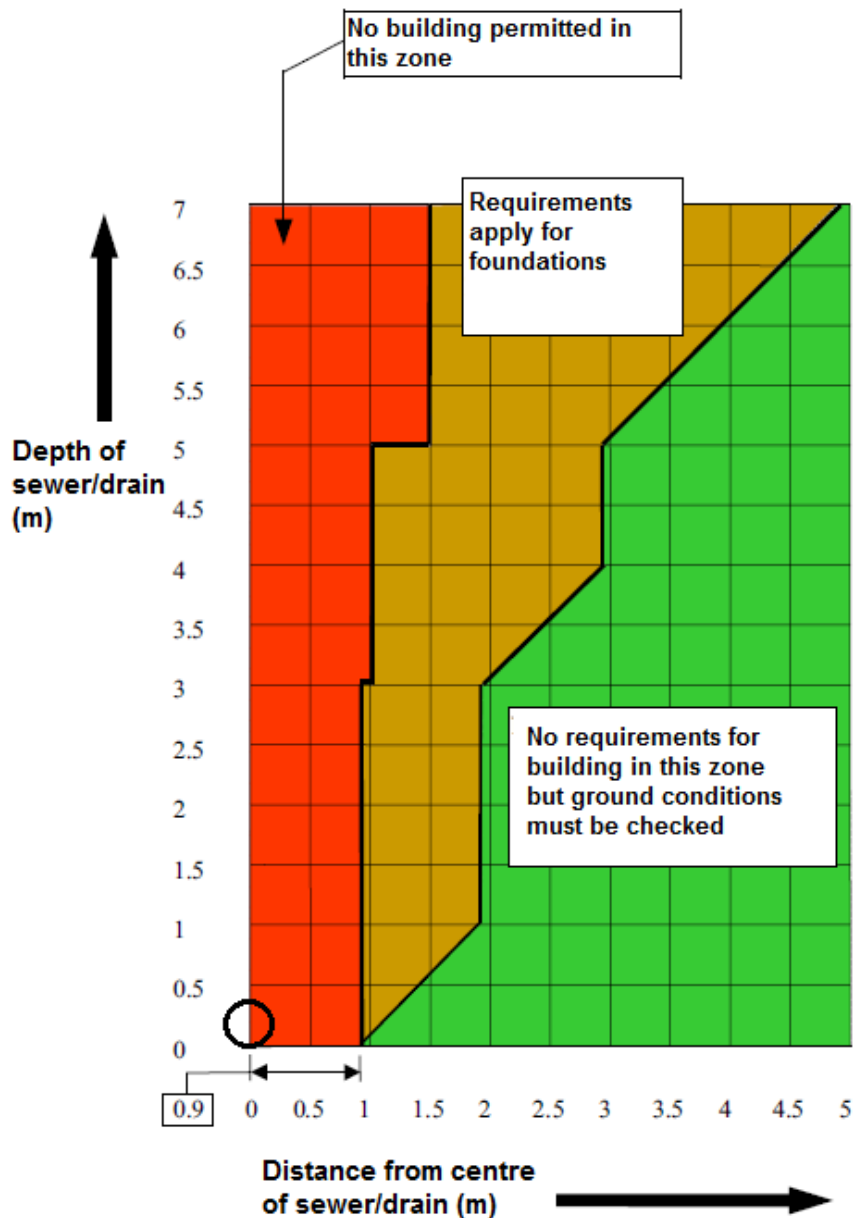




Graph 6 – Below ground pools, spas, tanks and basements

Proposed Structure Type	Sewer/Drain Details								
	Concrete Encased		Diameter (mm)			Material			
	No	Yes	150	225	300 - 600	PVC	VC	AC	All
Pools, Spas, Tanks and Basements									


 Shading denotes the situation that applies

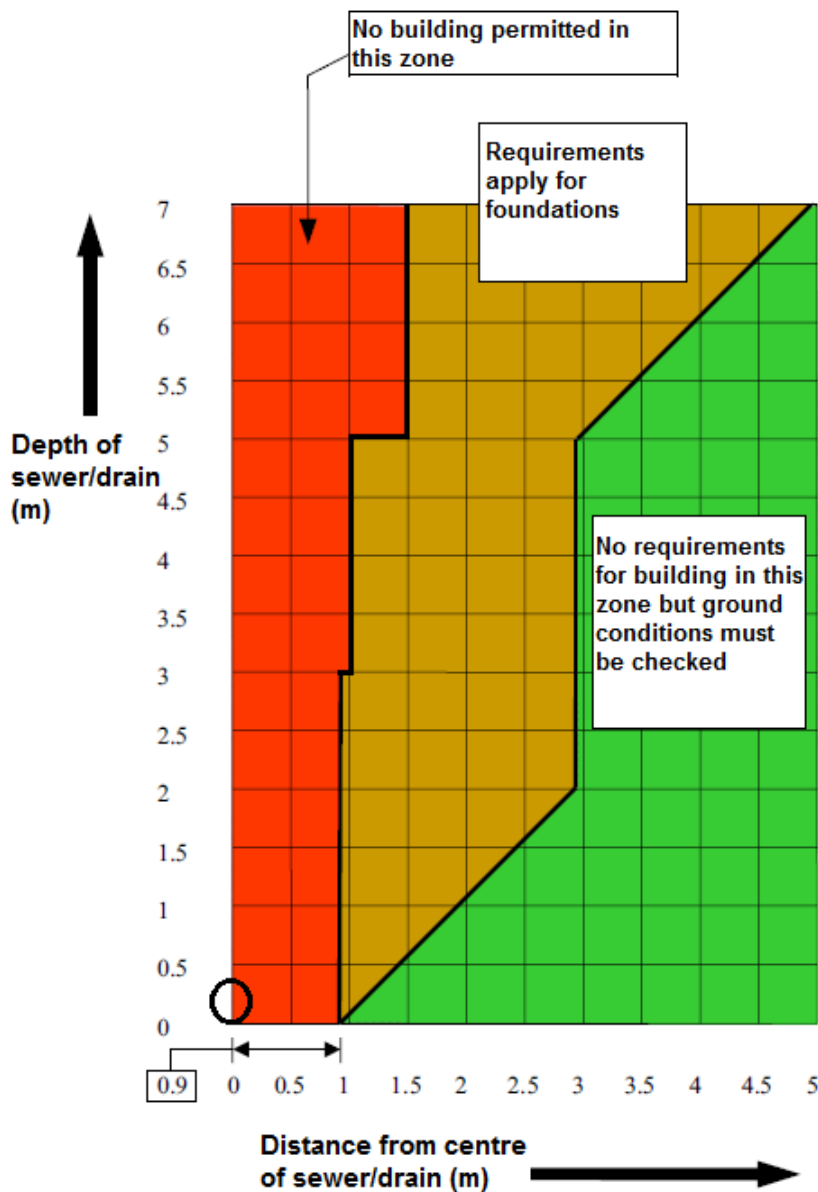




Graph 7 – Below ground pools, spas, tanks and basements

Proposed Structure Type	Sewer/Drain Details								
	Concrete Encased		Diameter (mm)			Material			
	No	Yes	150	225	300 - 600	PVC	VC	AC	All
Pools, Spas, Tanks and Basements									

 Shading denotes the situation that applies

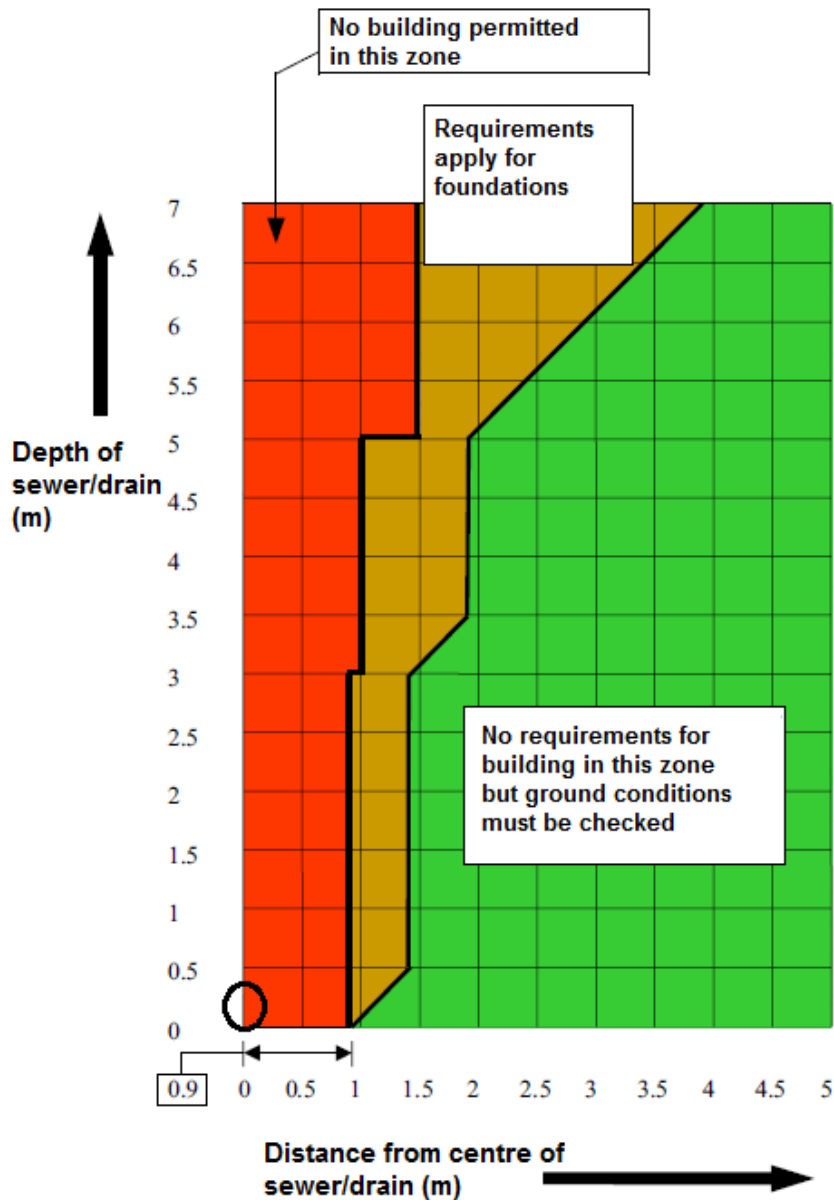




Graph 8 – Below ground pools, spas, tanks and basements

Proposed Structure Type	Sewer/Drain Details								
	Concrete Encased		Diameter (mm)			Material			
	No	Yes	150	225	300 - 600	PVC	VC	AC	All
Pools, Spas, Tanks and Basements									

Shading denotes the situation that applies

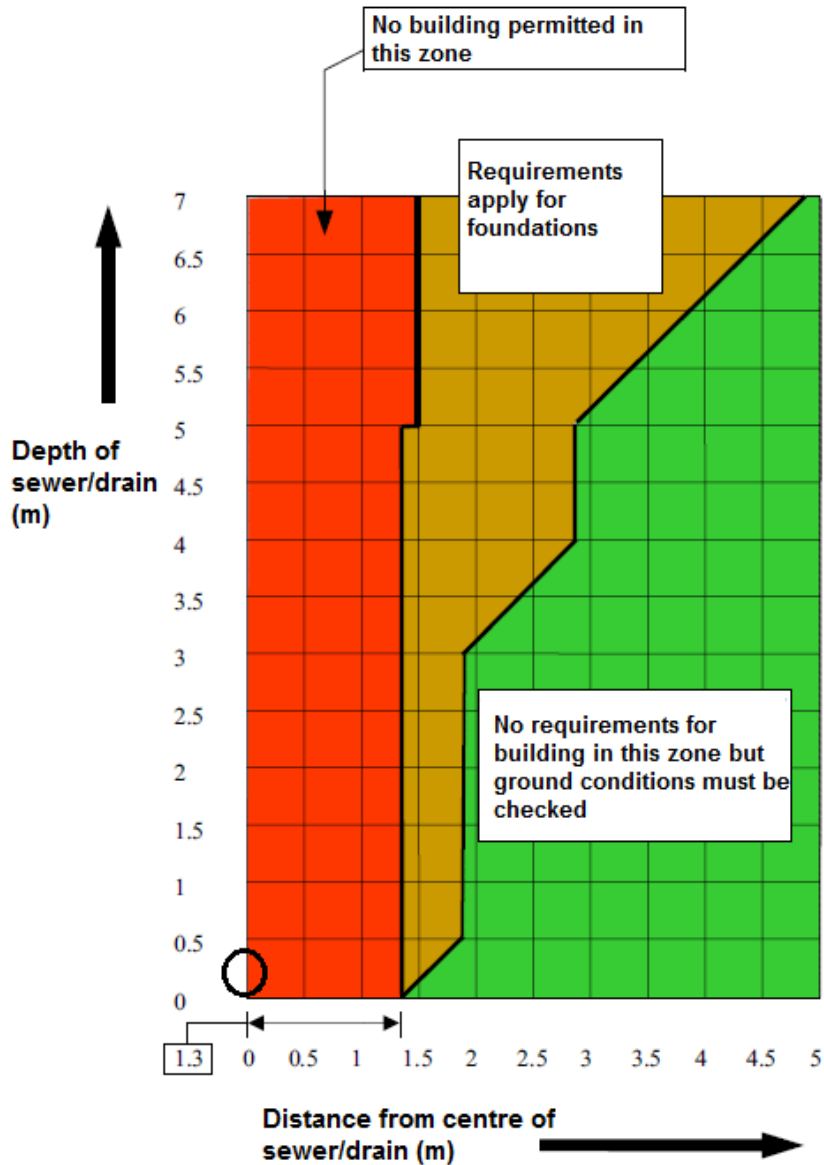




Graph 9 – Below ground pools, spas, tanks and basements

Proposed Structure Type	Sewer/Drain Details								
	Concrete Encased		Diameter (mm)			Material			
	No	Yes	150	225	300 - 600	PVC	VC	AC	All
Pools, Spas, Tanks and Basements									


Shading denotes the situation that applies

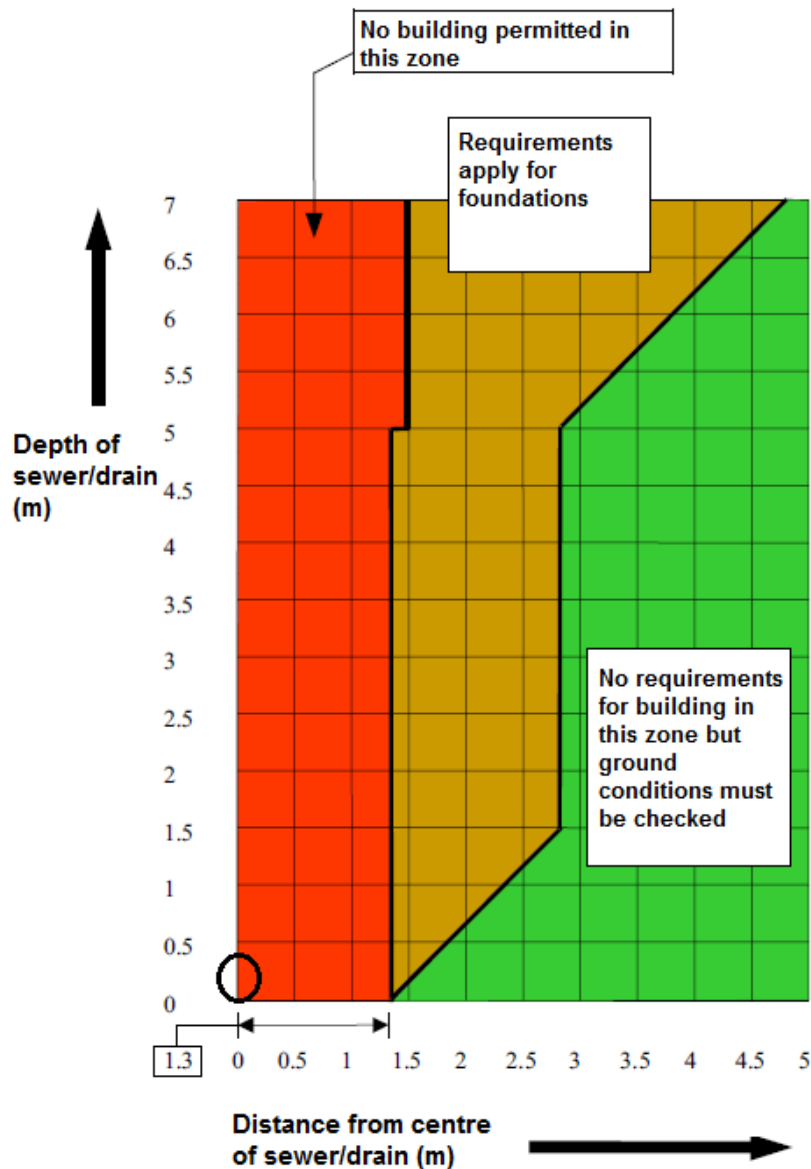




Graph 10 – Below ground pools, spas, tanks and basements

Proposed Structure Type	Sewer/Drain Details								
	Concrete Encased		Diameter (mm)			Material			
	No	Yes	150	225	300 - 600	PVC	VC	AC	All
Pools, Spas, Tanks and Basements									

 Shading denotes the situation that applies





Appendix 3: Guidelines for enclosing sewers in tunnels

Listed below are design guidelines for enclosing sewers in tunnels (these guidelines can also be applied to main drains).

Enclosing sewers or drains in tunnels is considered to be as a last resort and is only acceptable if it is not possible to relocate the sewer into road reserve or public land.

It is to be noted that tunnels are not acceptable in high groundwater locations

While the sewer remains at all time the property of the Water Corporation, the tunnel structure and the access lids are the responsibility of the building owner.

Condition assessment

- a) Depending on the age and condition of the sewer to be tunnelled, complete replacement of the sewer may be required as a condition of tunnelling. Where replacement of AC RC and VC sewers is required, they should be replaced with PVC pipeline (or other approved material as per Design Standards) of equal internal diameter.
- b) Depending on future demand requirements, sewers may also need to be increased in size or strength. Replacements above and beyond like-for-like replacements required to meet future demands will be borne by Water Corporation.

Design

- a) Tunnels and sewer replacements (where required) for **sewer reticulation** assets (typically sewers with a diameter of 300 mm and smaller) shall be designed by a design engineer who is a suitably qualified practicing professional engineer with appropriate engineering experience, and is a holder of our current design standards.
- b) For all **sewer mains** (typically sewers with a diameter of than 375 mm and greater), protection works must be designed by one of the design engineers from our [prequalified engineering consultants list](#).
- c) All designs shall be in accordance with current editions of applicable Water Corporation and Australian design standards.
- d) Tunnels are to be designed for a life of 100 years.
- e) Tunnels must be square or rectangular in cross-section with vertical walls. The table below details the minimum tunnel size requirements.

Sewer depth (m)	Minimum tunnel size (mm)
< 1.5	tunnel not permitted
1.5 to 2.1	1200 x 1200
2.1 to 5.0	1800 x 1800
More than 5.0	Based on individual assessment

- f) The minimum clearance between the underside of the access tunnel roof slab (tunnel soffit) and the top of the sewer shall be 0.9 m. To achieve this clearance in a tunnel, the minimum internal tunnel diameters are as follows:

Sewer size (mm)	Tunnel internal height (mm)
150 - 225	1200



300 - 450	1500
600	1650

- g) Sewers shall be adequately restrained against uplift and lateral movement, and shall not be used as a means of preventing flotation of the tunnel.
- h) Sewers in tunnels shall be laid on a sand underlay with side support compacted to the level of the pipe centre.
- i) The ends of sewer tunnels are to be formed with a structural wall and shall be properly sealed off to prevent the ingress of soil, water and gas. Structural load on the sewer shall be avoided by using suitable compressible material between the sewer and the end wall of the tunnel.
- j) The design engineer is responsible for assessing long term settlement of the adjacent building or structure. Typically clearances of 50 to 80 mm would be allowed, however, the actual dimensions could only be determined based on the structural design engineer's assessment of long-term building or structure settlement.

Tunnel access and ventilation

- k) Tunnel access shall be provided via access chambers. Access chamber and ventilation spacing requirements are detailed in the table below.

Sewer size (mm)	Sewer length (m)	Access chamber requirements	Vent requirements
150 - 225	0 - 20	Access chamber required at one end of the tunnel	A vent of at least 230 mm diameter or an access opening is to be provided within 1.5 m of each tunnel end
	> 20	Access chamber required at both ends of the tunnel and at spacing no greater than 100 m	
300 - 600	0 - 20	Access chambers required on both ends of the tunnel regardless of length and at spacing no greater than 100 m	
	> 20		

- l) Access chambers shall be designed to meet the requirements of Water Corporation Design Standard 50 – Design and Construction Requirements for Gravity Sewers DN150 to DN600.
- m) Holes cut into the soffit of a culvert to allow access are not acceptable.
- n) Access openings to a tunnel should be located to allow Water Corporation access 24 hours/day, every day of the year via the property in which the access chamber is located. An unconfined access way of at least 1.0 m wide is required around the access chamber at all times – as per Fig 6.
- o) Tunnel vents shall vent externally and be taken to roof level but forced ventilation may be used when access is required.
- p) Tunnel vent and access chamber covers shall be trafficable where appropriate.

Property connections

- q) Existing property connections shall be relocated such that they are in accessible locations outside of tunnels. Where this is not possible they shall be located in the corner of a tunnel access chamber. Unobstructed access to the inspection shaft is then required from within the access chamber and more than one property connection may be provided in each access chamber.



Design Drawings

- r) Drawings are to be certified by the design engineer and submitted to Water Corporation for approval in principle. We will not check the structural design.
- s) The drawings are to show in plan and elevation the tunnel and sewer, its alignment, levels and relationship to the surrounding buildings, access chambers and access routes to the access chambers, reinforcing, sewer supports, connections, waterproofing and all dimensions in a suitable scale.
- t) The location of the sewer is to be accurately located (potholed) and surveyed by a qualified surveyor and indicated on the drawings.
- u) All survey coordinates are to be to MGA94 standard. Assets are to be shown in both plan and elevation to the nearest centimetre for height and nearest mm for distance unless approved otherwise.
- v) Northings and eastings are required of the centreline of the access chamber, extremities of assets within the property and critical points along the pipeline affected by the proposed development.
- w) Levels are required to be to the Australian Height Datum (AHD).